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09/692578



PATENT

Attorney's Docket No. 948-5

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Assistant Commissioner for Patents  
**Box Patent Application**  
Washington, D.C. 20231

**UTILITY PATENT APPLICATION TRANSMITTAL**

Sir:

Transmitted herewith for filing is the patent application of:

First Named Applicant (or Applicants): Mark Salerno

Title of Application:

**METHOD AND APPARATUS FOR MONITORING THE STATUS AND  
TRANSFER OF FOOD PRODUCTS**

**1. Type of Application (37 C.F.R. 1.53(b))**

This application is a(n):

- ☒ Original (nonprovisional) application.
- ☐ Continuing application:
- ☐ Divisional ☐ Continuation ☐ Continuation-in-Part (CIP)
- of Serial No. 08/\_\_\_\_\_, filed on \_\_\_\_\_.

**CERTIFICATION UNDER 37 CFR 1.10**

I hereby certify that this New Application Transmittal and the documents referred to as enclosed herein are being deposited with the United States Postal Service on this date, October 19, 2000, in an envelope as "Express Mail to Addressee" Mailing Label Number EL633572064US, addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Julie L. Watts

Name of person mailing paper

  
Signature of person mailing paper

2. **Enclosed Papers Required to Obtain Application Filing Date under 37 CFR 1.53(b)**

81 Pages of specification  
33 Pages of claims  
1 Pages of Abstract  
33 Sheets of drawings ☐ Formal ☒ Informal

3. **Oath or Declaration**

- ☒ Newly executed Oath or Declaration (original or copy) is enclosed.
- ☐ Copy of Oath or Declaration from prior application 0 / (37 C.F.R. 1.63(d)).
- ☐ The entire disclosure of the prior application, from which a copy of the oath or Declaration is supplied, is considered as being a part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
- ☒ With Power of Attorney ☐ Without Power of Attorney

4. **Additional Papers Enclosed**

- ☒ Return Receipt Postcard (specifically itemized) (M.P.E.P. § 503).
- ☐ Preliminary Amendment.
- ☐ Information Disclosure Statement (37 CFR 1.98).
- ☐ Form PTO-1449 ☐ Copies of IDS Citations
- ☐ Nucleotide and/or Amino Acid Sequence Listing computer-readable copy, paper copy, and statement verifying identity of computer-readable and paper copies.
- ☐ Certified Copy of Priority Document(s).
- ☐ Verified translation of non-English language application (37 C.F.R. 1.52(d)).
- ☐ Other: \_\_\_\_\_.

5. **Assignment**

- ☐ Newly Executed assignment with Recordation Cover Sheet (Form PTO-1595).
- ☐ Copy of Assignment from prior application No. 08/.

**6. Fee Calculation (37 CFR 1.16)**

Regular Application (37 CFR 1.16(a))

Basic Fee \$710.00

**FEES FOR CLAIMS AS FILED**

Number filed	Number extra	Rate	
Total Claims (37 CFR 1.16 (c))	99 - 20	= 79 x \$ 18.00	= \$ 1,422.00
Independent Claims (37 CFR 1.16(b))	6 - 3	= 3 x \$ 80.00	= \$ 240.00
Multiple Dependent Claims (37 CFR 1.16(d))		+ \$ 270.00	= \$ 0.00
Fee Calculation for Extra Claims			\$ 1,662.00

- ☐ Amendment canceling extra claims enclosed.
- ☐ Amendment deleting multiple-dependencies enclosed.

Total Filing Fee Calculation \$ 2372.00

**7. Small Entity Statement**

- ☒ Verified Statement that this is a filing by a small entity under 37 CFR 1.9 and 1.27:
- ☒ is enclosed. ☐ will follow.
- ☐ Status as a small entity was claimed in prior application **08/**\_\_\_\_\_, from which benefit is being claimed for this application under:
- ☐ 35 U.S.C. 119(e),
- ☐ 35 U.S.C. 120,
- ☐ 35 U.S.C. 121,
- ☐ 35 U.S.C. 365(c),
- and which status as a small entity is still proper and desired.
- ☐ A copy of the verified statement in the prior application is enclosed.

Filing Fee Calculation (50% of Filing Fee calculated in Item 6 above)

\$ 1186.00

**8. Fee Payment**

☐ Not enclosed. No filing fee is to be paid at this time.

☒ Enclosed:

☒ Basic filing fee (Item 6 or 7 above) **\$ 1,186.00**

☐ Fee for recording Assignment  
(\$40.00 (37 CFR 1.21(h))) \$

☐ Processing and retention fee  
(\$130.00 (37 CFR 1.53(d) and 1.21(l))) \$

Total fees enclosed **\$ 1,186.00**

**9. Method of Payment of Fees**

☒ Check in the amount of \$ 1,186.00.

☐ Charge Deposit Account No. 08-2461 in the amount of \$ \_\_\_\_\_.  
A duplicate of this transmittal is enclosed.

**10. Authorization to Charge Additional Fees**

☒ The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Deposit Account No. 08-2461:

☒ 37 CFR 1.16(a), (f), or (g) (filing fees)

☒ 37 CFR 1.16(b), (c), and (d) (presentation of extra claims)

☒ 37 CFR 1.16(e) (surcharge for filing the basic fee and/or declaration at a date later than the filing date of the application)

☒ 37 CFR 1.17 (application processing fees)

A duplicate of this transmittal is enclosed.



Figure 1 consists of 12 subplots, labeled (a) through (l), each showing a time course of a different physiological parameter over a 10-minute period. The x-axis for all plots is 'Time (min)' ranging from 0 to 10. The y-axis for all plots is 'Arbitrary Units' ranging from 0 to 10. The parameters and their approximate trends are: (a) HR (Heart Rate) increases from ~5 to ~8; (b) BP (Blood Pressure) increases from ~2 to ~5; (c) RR (Respiratory Rate) increases from ~2 to ~5; (d) SpO<sub>2</sub> (Oxygen Saturation) increases from ~80 to ~95; (e) P<sub>1</sub> increases from ~2 to ~5; (f) P<sub>2</sub> increases from ~2 to ~5; (g) P<sub>3</sub> increases from ~2 to ~5; (h) P<sub>4</sub> increases from ~2 to ~5; (i) P<sub>5</sub> increases from ~2 to ~5; (j) P<sub>6</sub> increases from ~2 to ~5; (k) P<sub>7</sub> increases from ~2 to ~5; (l) P<sub>8</sub> increases from ~2 to ~5.

☐ Refund.

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**PATENT**

Attorney's Docket No. 948-5

Applicant or Patentee: Mark Salerno

Serial or Patent No.: Unassigned

Filed or Issued: Herewith

For: METHOD AND APPARATUS FOR MONITORING THE STATUS AND TRANSFER  
OF FOOD PRODUCTS

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY  
STATUS (37 CFR 1.9(f) AND 1.27(b))--INDEPENDENT INVENTOR**

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled:

METHOD AND APPARATUS FOR MONITORING  
THE STATUS AND TRANSFER OF FOOD PRODUCTS

described in

- ☒ the specification filed herewith.  
☐ application serial no. 0 / \_\_\_\_\_, filed \_\_\_\_\_.  
☐ patent no. \_\_\_\_\_, issued \_\_\_\_\_.

I have not assigned, granted, conveyed, or licensed and am under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- ☒ no such person, concern or organization.  
☐ persons, concerns or organizations listed below:\*

\*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27).

FULL NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_

☐ INDIVIDUAL    ☐ SMALL BUSINESS CONCERN    ☐ NONPROFIT ORGANIZATION

FULL NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_

☐ INDIVIDUAL    ☐ SMALL BUSINESS CONCERN    ☐ NONPROFIT ORGANIZATION


FULL NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_

☐ INDIVIDUAL    ☐ SMALL BUSINESS CONCERN    ☐ NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

\_\_\_\_\_  
Mark Salerno

  
\_\_\_\_\_  
Signature of Inventor

Date 10/18/2000

Docket No.: 948-5

**METHOD AND APPARATUS FOR MONITORING**  
**THE STATUS AND TRANSFER OF FOOD PRODUCTS**

006707-256660

Inventor: Mark Salerno

**METHOD AND APPARATUS FOR MONITORING**  
**THE STATUS AND TRANSFER OF FOOD PRODUCTS**

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**CROSS-REFERENCE TO RELATED APPLICATION**

This application claims the benefit of U.S. Provisional Application No. 60/160,878, filed October 22, 1999, which is incorporated herein by reference.

10

**BACKGROUND OF THE INVENTION**

**Field of the Invention**

15           This invention relates generally to systems which monitor a status of a product, such as prepared food, and more specifically relates to automated product status systems which communicate the status of multiple food products to food preparers, and enable the transfer of food products within the system.

20           **Description of the Prior Art**

          The control of product freshness and quality has always been a major concern with industries, such as restaurants, dealing with the sale of perishable goods, such as prepared foods. Numerous inventory control systems exist which track parameters  
25   such as the origin, quantity used, quantity stored and the age of products. However, an automated system, which monitors the shelf life of perishable goods, has not yet been placed into practice. In addition, many of the systems and methods for monitoring product status currently in use cannot ensure that the oldest product is used first or that available product is optimally used to minimize waste. Therefore, it  
30   would be advantageous if such a system or method could accurately and efficiently track the status of perishable goods while providing a means for reducing the amount of waste.

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In the restaurant industry, at least two durations of time become important variables to monitor. One is a hold time, which is the shelf life of prepared food or the duration of time during which a particular product meets a set of standards imposed by the food provider. The second variable is a cook time, which is the duration of time required to cook and/or prepare additional product. The cook time must be accounted for if product is to be continually available. In conventional product status systems, employees or workers engaged in the preparation of food typically monitor the hold and cook times, and are required to set, monitor and reset a different timer for each of the large number of food products being sold. Such a situation results in a tremendous inefficiency in the use of manpower and a reduction in productivity. In addition, the potential for human error can lead to an unacceptable or dangerous product being sold to the consumer. Therefore, it would be advantageous if the hold time, cook time and other variables relevant to the preparation and sale of the food product could be automatically monitored and provided to the worker in summary format without undue human intervention.

In most restaurants, the status of products and the need for additional products is communicated by shouting requests or commands across the kitchen or other food preparation area. This results in additional noise, confusion and often misinformation, which ultimately affects the quality of the food being provided to the consumer as well as the environment, provided for the consumers enjoyment within the restaurant. Therefore, a system and method that could effectively communicate the status of each of many products being offered for sale to all workers without the need for individual communication between workers would be advantageous.

Conventional methods of tracking product status do not provide an efficient means for collecting and processing information concerning loss or waste of perishable goods once they have been prepared for sale; the rate of sale for each product during different periods of the day and promotional events; and worker productivity. Therefore, it would be advantageous if a product status system could

provide information on such variables for use in management databases and as a planning tool.

Many of the product status systems in the prior art, such as those using individual timers monitored by workers for each of a number of different products being sold, require that additional timers be used, and that the workers become familiar with additional hold and cook times when new and/or different products are sold. Therefore, it would be advantageous if a product status system was flexible and readily upgradeable to adapt to different types and quantities of food products without burdening the workers and decreasing productivity.

### **OBJECTS AND SUMMARY OF THE INVENTION**

It is an object of the present invention to provide a product status system and a method for indicating the stock status of food products, which communicate the status of food products to all workers rather than requiring individual communication between workers.

It is another object of the present invention to provide a product status system and a method for indicating the stock status of food products, which monitor shelf life and displays stock status corresponding to a pan of food product in digital format to reduce errors.

It is yet another object of the present invention to provide a product status system and a method for monitoring the status of food products, which enable complete or partial transfers of a food product throughout the system to ensure availability of the food product according to demand from different locations in the system.

It is a further object of the present invention to provide a product status system and a method for monitoring the status of food products, which do not permit cross

transfers between pans of food products located in non-corresponding locations unless specifically programmed to do so.

5 It is an object of the present invention to provide a product status system and a method for monitoring the status of food products, which enable station worker interface boards to be substantially identical regardless of whether they are mounted on the front or rear of the station.

10 It is another object of the present invention to provide a product status system and a method for programming and displaying the amount of food products to be prepared that can be manually adjusted or automated according to the time, the day, promotional events, the anticipated rate of sale, and the like.

15 It is yet another object of the present invention to provide a product status system and a method for monitoring the status of food products that facilitates the use of the oldest food product first, thereby decreasing the waste of perishable goods.

20 It is a further object of the present invention to provide a product status system, which is flexible and readily upgradeable and/or programmable to meet the requirements imposed by different types and quantities of food products offered for sale.

25 It is an object of the present invention to provide a product status system and a method for monitoring the status of food products, which eliminate the need for workers to monitor individual variables for a variety of food products being sold, such as a shelf life, a stock status and a quantity of food product to cook, which improves overall operational efficiency, decreases waste associated with a perishable food product, decreases the manpower required to prepare the food product for sale and increases the efficiency of individual workers.

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In accordance with the present invention, a product status system is provided which monitors the status and storage location of a prepared food product including a



processing circuit, a food product status switch, a food product status indicator, and a storage timer. The food product status indicator displays the status of the food product in a particular storage location. The storage timer counts the duration of time the food product has been stored at the storage location. The status indicates whether or not the prepared food product is available in the storage location, whether the storage time of the food product has exceeded an acceptable food product hold time, and when additional food product should be cooked in order to be ready before the storage time of existing food product exceeds the hold time.

10 The product status system can include a plurality of storage locations, such as a source storage location and a destination storage location, between which the food product is transferred along with the storage time associated therewith. In this case, the storage time from the source storage location is transferred to a destination storage timer associated with the destination storage location, and the destination storage  
15 timer counts the duration of time the food product has been stored at both the source and destination storage locations. The status can also indicate which of two or more source storage locations contains the food product, which has been stored for the greatest length of time to facilitate use of the oldest product first. In addition, the status can indicate which of two or more destination storage locations to transfer a  
20 given food product into.

The product status system can include a display which displays the status, a pan fill level, an activity level and a day part associated with the prepared food product. Each of the food products can have a different pan fill level associated  
25 therewith, which represents a quantity of food product to prepare when the associated storage location becomes empty. The activity level represents an overall rate of sale for all of the food products in a restaurant, and can affect the pan fill level for any or all of the food products.

30 In further accordance with the present invention, a method for monitoring the status and storage location of a prepared food product is provided, which includes the steps of supplying the prepared food product to the storage location, changing the state

of the food product status indicator, initiating a storage timer to count the storage time for the food product in the storage location, comparing the storage time with the acceptable food product hold time, changing the state of the food product status indicator if the storage time exceeds the hold time and changing the state of the food product status indicator when the storage location no longer contains the food product.

The storage time can be transferred with the food product if there are two or more storage locations, such as the source storage location and the destination storage location. In this case, the state of the food product status indicator is changed to indicate when the duration of time the food product has been stored at both the source and destination storage location exceeds the hold time. The state of the food product status indicator can also be changed to indicate which of two or more storage locations contains food product which has been stored longer, and which of two or more storage locations a given food product undergoing a transfer can be transferred into.

These and other objects, features, and advantages of the present invention will be apparent from the following detailed description of illustrative embodiments thereof, which is to be read in connection with the accompanying drawings.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

Figure 1 is a block diagram of a product status and transfer system formed in accordance with the present invention and applied to a restaurant.

Figure 2 is a front view of a workstation, such as a drive-through station, a front counter station, or a holding station of the product status and transfer system formed in accordance with the present invention.

Figure 3 is a front view of a display and the holding station of the product status and transfer system formed in accordance with the present invention.

Figure 4 is an enlarged view of the display shown in Figure 3.

Figure 5A shows a product label, product status switches, and product status indicators, which are located on the stations formed in accordance with the present invention.

Figure 5B shows an active switch, an active indicator, a transfer switch, and a transfer indicator, which are located on the stations formed in accordance with the present invention.

Figure 6 is a flowchart of an active/inactive station routine used in a method formed in accordance with the present invention.

Figures 7A & 7B are flowcharts of a product transfer routine used in the method formed in accordance with the present invention.

Figure 8A is a flowchart summarizing the product transfer routine shown in Figures 7A and 7B.

Figure 8B is a block diagram showing the operation of a multiple transfer used in the method formed in accordance with the present invention.

Figure 8C is a flowchart of a minimum stock level routine formed in accordance with the present invention.

Figures 8D and 8E show a front and rear view of the holding station, respectively.

Figure 8F shows a flowchart for a product transfer algorithm formed in accordance with the present invention.

Figures 9A and 9B are flowcharts of the method for monitoring a status for each of a plurality of products formed in accordance with the present invention.

Figure 10 is a circuit board level block diagram of the product status and transfer system formed in accordance with the present invention.

Figure 11 is a schematic diagram of a station/worker interface board (SWIB) of the product status and transfer system formed in accordance with the present invention.

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Figure 12 is a schematic diagram of an active/transfer board (ATB) of the product status and transfer system formed in accordance with the present invention.

Figure 13 is a schematic diagram of a station interface board (SIB) of the product status and transfer system formed in accordance with the present invention.

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Figures 14A and 14B are schematic diagrams of a station control board (SCB) of the product status and transfer system formed in accordance with the present invention.

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Figures 15A-15L are schematic diagrams of a display board (CDB) of the product status and transfer system formed in accordance with the present invention.

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## **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

### **Top Level Description of Product Status and Transfer System**

Figure 1 shows a top-level block diagram of a product status and transfer system 10 formed in accordance with the present invention and applied to a restaurant serving prepared food. The product status and transfer system (PSTS) 10 preferably

includes one or more front counter stations 12, one or more drive-through stations 14, a holding station 16, and a display 18. The display 18 may be centrally located. The front counter station 12 is preferably located near a serving counter and a corresponding cash register 20. The drive-through station 14 is preferably located near a window 22 through which workers service drive-up customers in their cars 24. The holding station 16 and the display 18 are preferably located in a centralized location, which is readily accessible to the front counter stations 12 and the drive-through station 14. Seating 26 may also be provided within the restaurant.

The drive-through station 14 and the front counter stations 12 preferably each enable two sandwich makers 28 standing on opposing sides of the stations 12, 14 to remove cooked product from the stations 12, 14 and to prepare the cooked product for sale to a consumer. The holding station 16 preferably enables at least one expeditor 30 to cook the food product and place the cooked product into the holding station 16. A store manager 32 is preferably responsible for managing the operation of the restaurant. The sandwich makers 28 and the expeditor 30 are collectively referred to as workers 28 or workers 30 according to the station they are working at.

Figure 2 shows a pictorial representation of a front view of the front counter station 12, drive-through station 14 and holding station 16, which are collectively referred to as the station 12, 14, 16. The station 12, 14, 16 preferably includes at least one active switch 34, at least one active indicator 36, at least one transfer switch 38, at least one transfer indicator 40, product status switches 42, product status indicators 44 and product labels 46. The holding station 16 is substantially the same as the front counter station 12 and the drive-through station 14, except that the holding station 16 is preferably designed for use by one worker 30. Thus, since the product located in the holding station 30 is intended to be accessed by only one worker 30, preferably only one active switch 34, one active indicator 36, one transfer switch 38 and one transfer indicator 40 exist on the holding station 16. In contrast, two of each of these switches and indicators exist on each of the front counter station 12 and the drive-through stations 14.

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The stations 12, 14, 16 can preferably each accommodate up to 24 different pans 48 of food product as shown in Figure 2. Each product status switch 42 and product status indicator 44 corresponds to a particular pan 48 of product. The stations 12, 14, 16 preferably include three rows 50 of product status switches 42, product status indicators 44 and product labels 46. Each row 50 corresponds to an upper row of pans 52 and a lower row of pans 54. The upper row of pans 52 is preferably used by the worker 28 on one side of the station 12, 14, while the lower row of pans 54 is preferably used by the worker 28 on the opposing side of the station 12, 14. Thus, the upper row of pans 52 holds what is preferably considered to be primary pans by the worker on one side of the station 12, 14, while the lower row of pans 54 holds what is preferably considered to be secondary pans by the worker 28 on the opposing side of the station 12, 14. Conversely, the lower row of pans 54 holds what is considered to be primary pans by the worker 28 on one side of the station 12, 14, while the upper row of pans 52 holds what is considered to be secondary pans by the worker 28 on the opposing side of the station 12, 14. The primary pan corresponding to a particular side of the station 12, 14 is preferably used exclusively by the worker 28 located on that side of the station 12, 14. However, should the primary pan be empty, the worker 28 can use the product located in what is considered to be the secondary pan (which is considered the primary pan for the worker 28 on the opposing side of the station 12, 14).

The use of upper and lower rows of pans 52, 54 effectively enables two workers 28 to work at the station 12, 14 simultaneously without interfering with each other. Since as already described, there is preferably only one worker 30 at the holding station 16, that worker 30 preferably has equal access to both upper and lower rows of pans 52, 54. The food products are preferably located within pans 48 at the stations 12, 14, 16 which are ergonomically advantageous according to a rate of sale for that product. In other words, those products that are sold most often are preferably placed in the location most easily accessed by the worker at the station 12, 14, 16. Also, the same product is preferably placed in substantially the same location in each of the stations 12, 14, 16.

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The product label 46 preferably indicates the identity of the food product or the selectable menu, which is located in the pan 48 immediately above and immediately below the product label 46. It is important to note that the product label 46, the food product status switch 42, and the food product status indicator 44 are preferably located in alignment with the corresponding food product pan 48. Alternatively, the identity of the food product or selectable menu associated with the pan 48 may be electronically displayed and changed in response to a selectable menu switch. The products immediately above and below the product label 46 are preferably the same since this allows two workers 28 to access the same product at the same station simultaneously, as well as the concept of primary and secondary pans described above.

The product status indicators 44 are preferably shaped in the form of an arrow. The product status switch 42 and the product status indicator 44 modify and indicate, respectively, the status of the products located in the pan pointed to by the corresponding product status indicator 44. For instance, as shown in Figure 2, the product label 46, the product status indicator 44A and the product status switch 42A correspond to an upper pan 48A. Likewise, the product label 46, the product status indicator 44B and the product status switch 42B correspond to a lower pan 48B. If the products in corresponding upper and lower pans are different, the product label 46 can be divided into an upper portion indicating the identity of the product in the upper pan 48A, and a lower portion indicating the identity of the product in the lower pan 48B.

The active switch 34 and the active indicator 36 can modify and display the activity of the station 12, 14, 16. The transfer switch 38 and the transfer indicator 40 are used to initiate and indicate a transfer of the food product between locations in the same or different stations 12, 14, 16.

Figure 3 shows the holding station 16, which is equivalent to the drive-through station 14 and the front counter station 12, except that one worker 30 preferably operates the holding station 16, and both the upper and lower rows of product pans 52, 54 are accessed by that worker 30. In addition, the display 18 is preferably located in

a position which is viewable by the worker 30 operating the holding station 16, such as above the holding station 16 as shown in Figure 3.

#### Top Level Summary of Operation

5           At the beginning of a day in the restaurant, the worker 30 situated in front of the holding station 16 cooks a predetermined quantity or pan fill level of each product as indicated on the display 18, and stores the cooked product in the appropriate pan 48 in the holding station 16. Each product has a corresponding hold time, which represents a shelf life of the cooked product or a duration of time during which the  
10       product has an acceptable quality and can be served to consumers. The worker 30 then presses the product status switch 42 on the holding station 16 corresponding to the pan 48 just filled indicating the presence of cooked product, and triggering a timer corresponding to the location just filled to initiate a count of the storage time for the corresponding food product. The cooked product is then transferred from the holding  
15       station 16 to the front station 12 and the drive-through station 14 along with the storage time corresponding to the product being transferred.

          As product is prepared and sold to consumers, the cooked food products at the stations 12, 14 are depleted. When the last unit of a particular product has been  
20       removed from one of the stations 12, 14, the worker 28 presses the product status switch 42 corresponding to the depleted product, which indicates that there is an absence of the depleted product in a particular location in the station 12, 14 via a corresponding product status indicator 44 on the display 18. The worker 30 at the holding station 16 observes the product status indicator 44 corresponding to the  
25       depleted product, and either cooks fresh product or transfers existing cooked product from the holding station 16 to the station 12, 14 requiring the cooked product.

          If one of the cooked food products is retained in one of the stations 12, 14, 16 for a time which exceeds the hold time for that particular product, the corresponding  
30       product status indicator 44 will indicate that the product should be discarded rather than being sold to the consumer. The product status indicator 44 will also warn the workers 28, 30 that the hold time is about to expire by turning yellow to indicate that



additional product must be cooked in order to have cooked product before the existing product expires. A cook time represents a duration of time required to cook the corresponding product. The product status indicator 44 preferably turns yellow when the storage time for the product equals the hold time minus the cook time. Thus, enough time is provided to cook additional product prior to the expiration of existing cooked product. The product status indicators turn green to indicate that unexpired food product is available at a particular location in a station 12, 14, 16, and turn red to indicate the absence of the food product at a particular location in the station 12, 14, 16.

## Detailed Description of Common Functions and Components

### Active/Inactive Station

As already described, each of the stations 12, 14, 16 includes at least one active switch 34 and at least one active indicator 36. Additional active switches and indicators may be included to indicate activity of the upper and lower pans of the station 12, 14, as shown in Figure 5B. The front counter station 12 and the drive-through station 14 each have two active switches 34 and two active indicators 36. One active switch 34 and one active indicator 36, as shown in Figure 5B, correspond to each side of the station 12, 14. Initially upon power-up, all stations 12, 14, 16 are placed in an active mode in which each of the active indicators 36 is illuminated. Thereafter, the workers 28, 30 may select any of the active switches 34 which function to place the station 16 or side of the station 12, 14 corresponding to the active switch 34 in an inactive mode. The active indicator 36 is not illuminated in the inactive mode.

When the station 12, 14, 16 is in the active mode, each of the product status indicators 44 are illuminated and indicate the status of the corresponding product. When the station 12, 14, 16 is in the inactive mode, each of the product status indicators 44 on the corresponding station 16 or side of the station 12, 14, as well as the product status indicator 44 corresponding to the inactive station 12, 14, 16 located on the display 18 are turned off. Activating any one of the active switches 34 causes

the corresponding station 16 or side of the station 12, 14 to toggle between the active mode and the inactive mode.

Figure 6 is a flowchart showing the operation of the stations 12, 14, 16 during an active/inactive station routine. The station idles in step 56 until the active switch is depressed or selected, and then determines whether the station is currently in the active mode in step 58. If the station is not in the active mode, the station enters the active mode in step 60 wherein the active indicator on the inactive station is illuminated and the product status indicators on the active station indicate the status of the corresponding products. However, if the station is in the active mode in step 58, the station enters the inactive mode in step 62 wherein the corresponding active indicator and the product status indicators on the inactive station are turned off. However, timing for any products being timed prior to entry into the inactive mode continues during the inactive mode. Following steps 60 and 62, the routine again idles in step 56 waiting for the next selection of the active switch. It is to be noted that the product status indicators on the display reflect the same status as the corresponding product status indicators on the stations. Therefore, if the station is in the inactive mode, the product status indicators on the display corresponding to the inactive station are off.

#### Product Timers

The product status and transfer system 10 includes at least one timer for each of the preferably 12 different products in the preferably 24 different product locations in each of the stations 12, 14, 16. When fresh product is placed in a particular pan 48 in the station 12, 14, 16, the corresponding product status switch 42 is selected by the worker 28, 30 until the corresponding product status indicator 44 turns green, which triggers the timer to begin counting the storage time. The green product status indicator 44 indicates that the pan 48 contains unexpired product. Preferably, the storage time is counted by loading the hold time into the timer when fresh product is first placed into a particular pan 48, and continuing to count down the hold time until

the corresponding food product has been depleted, or the timer reaches zero indicating that the storage time has reached the hold time.

The cook time corresponding to any given product is that duration of time necessary to cook the particular product. If the value remaining on the timer is less than or equal to the cook time, then the corresponding product status indicators 44 turn yellow indicating to the worker 30 at the holding station 16 that additional product should be cooked since the product corresponding to the yellow light is about to expire. When the timer has counted down to zero, the corresponding product status indicator 44 flashes slow red indicating that the product remaining in the corresponding pan has expired and should be discarded rather than being served to the consumer.

#### Product Status

As already described above, each of the 24 locations in each of the stations 12, 14, 16 has a corresponding product label 46, product status switch 42 and product status indicator 44 as shown in Figures 2, 3 and 5A. Each of the product status indicators 44 on each of the stations 12, 14, 16 has a corresponding product status indicator 44 on the display 18, which displays substantially the same status displayed to the workers 28, 30 at the stations 12, 14, 16. Table 1 provides a summary of the status and action to be taken for each of the colors and flashing speeds provided by the product status indicators 44.

COLOR	FLASHING SPEED	ACTIVE/INACTIVE SIDE/STATION	STATUS OF PRODUCT	ACTION TO BE TAKEN
Green	static	active	unexpired, existing	serve product
Red	static	active	no product	replenish product
Yellow	static	active	product is within cook	begin cooking more product

			time of expiring	
Red	slow	active	expired	discard product
Red	fast	active	product can be transferred into location during a pending transfer	transfer product into location
Green	slow	active	oldest product available to transfer out of location	transfer this product first
Off	static	inactive	none	none or place station in active mode

**TABLE 1**

**Product Transfer**

Each of the stations 12, 14, 16 preferably includes at least one transfer switch 38 and transfer indicator 40, as shown in Figures 2, 3 and 5B. The front counter station 12 and drive-through station 14 both have two transfer switches 38 and two transfer indicators 40. One transfer switch 38 and one transfer indicator 40 correspond to each side of the station 12,14. The holding station 16 has one transfer switch 38 and one transfer indicator 40 since preferably only one side is accessed.

10

Figures 7A and 7B are flowcharts of the operation of a product transfer routine. The station idles in step 64 until the transfer switch is selected. Once the transfer switch is selected, the routine continues to step 66 in which the transfer indicator on the corresponding station or side of the station, which is now considered to be a source station or location, is illuminated. The source station enters a transfer mode in step 68, and the routine performs a background process in step 70, which

15

determines whether a predetermined transfer time has expired. If the transfer time has expired, the system exits the transfer mode in step 71, and the routine proceeds back to step 64. If the transfer time has not expired, the background process in step 70 continues to idle.

5

After pressing the transfer switch on the source station, the product status indicator corresponding to the product which has been stored the longest flashes fast green, which indicates to the worker which product is the oldest and facilitates the use of the oldest product first. The product status indicators corresponding to locations holding products having a transfer in progress flash fast red indicating that the hold time may be transferred into these locations in step 74. The worker removes the product to be transferred from a source location in the source station, which is preferably the product corresponding to the product status indicator which is flashing fast green, and presses the corresponding product status switch which makes the corresponding storage time available to be transferred out in step 76. The worker then places the product being transferred into a destination location in a destination station in step 78. The destination station can be the same station as the source station. The destination location can also be the same location in the same station as the source location. The products are preferably transferred while in the pans 48. However, a portion of the food product in the pan may be transferred to more than one destination location. The destination location may be the same as the source location.

The flowchart continues on Figure 7B in which the worker presses the transfer switch on the destination station and fills the destination location with the product being transferred in step 80. The empty pans in the destination station corresponding to product with a transfer in progress will flash fast red indicating an empty pan with a potential for accepting the product being transferred. The worker presses the product status switch in step 82 corresponding to the destination location filled in step 78, and the corresponding product status indicator turns green in step 84 indicating that the hold time, which was transferred out of the source station, has now been transferred into the destination location along with the product that was transferred. If only a portion of the product transferred out of the source location was transferred into the

destination during a so-called “multiple transfer”, the remaining product can be transferred to additional destination locations including back to the source location in step 85. If additional transfers are desired, the routine returns to repeat steps 78, 80, 82 and 84 until no additional transfers are desired and the routine returns. This  
5 completes the product transfer routine until the transfer switch is again selected.

The product transfer routine is essentially a very straightforward and simple process, which can readily be performed by workers having almost any level of skill. Figure 8A shows a summarized form of the product transfer routine taken from the  
10 viewpoint of the worker. If the worker wishes to transfer product from one location to another, the worker selects or presses the transfer switch corresponding to the source station in step 86 and removes the product to be transferred in step 88. The worker then presses the product status switch corresponding to the source location in step 90. The worker transfers the product to the destination location and selects the transfer  
15 switch corresponding to the destination location in step 92. The worker selects the product status switch corresponding to the destination location in step 96. If some of the product transferred from the source location has not been transferred to the destination location, additional transfers can be made in step 97 via the reiteration of steps 92, 94 and 96 until additional transfers are no longer desired, at which point the  
20 routine returns. It is to be understood that the product transfer routine transfers not only product from one station to another, but also transfers the elapsed storage time corresponding to the product being transferred. This ensures the accurate maintenance of the storage time for each product regardless of the transfer of products within the  
25 system.

Figure 8F is a flowchart of an algorithm that enables the product status system to perform the product status transfer routine shown in Figure 7A. The holding station queries the stations in step 65 to determine if the corresponding transfer switch has been selected at any of the stations. If the transfer switch has been selected in step  
30 67, the holding stations obtains an array of storage times from the station corresponding to the transfer switch selected in step 69. The array includes twelve numbers representing the storage times for each of the twelve products stored in either

the upper or lower pans in any of the stations. If the transfer switch has not been selected at any of the stations, the algorithm returns to re-execute step 65 from step 67.

- 5           The array of storage times is stored in a buffer within each of the stations in step 71. If the transfer switch has been selected at the same or another station in step 73, that station will transfer the array of storage times from its buffer to its storage timers in step 75. If the transfer switch has not been selected in step 73 or after the array of storage times is transferred to the storage timers, the algorithm determines  
10 whether the predetermined transfer time has expired in step 77. If the transfer time has expired, the algorithm returns to step 65. If the transfer time has not expired, the algorithm returns to re-execute step 73.

- 15           Figure 8B is a block diagram showing the multiple transfer of food product between the source location and one or more destination locations. The food product and the elapsed storage time corresponding to the food product are transferred from the source location to the destination location in response to activation of the transfer switch corresponding to the source station and the product status switch  
20 corresponding to the source location as well as activation of the transfer switch corresponding to each of the destination stations and the product status switch corresponding to each of the destination locations. The source location can also be one of the destination locations by activating the transfer switch corresponding to the source station and the product status switch corresponding to the source station as indicated by arrow 79. In this way, the multiple transfer of product can be made from  
25 the source location back to the source location and one or more destination locations.

- As an alternative to selecting the transfer switch 38, the transfer of food product may be initiated by pressing and holding the product status switch 36. This results in a significant reduction in the quantity of electromechanical components  
30 required by the system, which increases reliability and reduces manufacturing costs.

### Minimum Stock Levels

Figure 8C shows a flowchart of a minimum stock level routine, which is designed to inactivate or close storage locations when there are more storage locations are open than are required to hold a given stock level of the prepared food product.

5 The stock level is equal to the total number of open stations for a given prepared food product multiplied by the pan fill level for that product. For instance, if the total number of stations open for burgers is 5 and the pan fill level for burgers is 8, the stock fill level is 40. However, the stock level indicates a preferred quantity of units of a given prepared food product, which should be present in the restaurant at any  
10 given time. Therefore, the stock level typically represents an initial value from which the pan fill level and number of open stations are determined. Thus, given a stock level of 42 for burgers, one possible result after rounding is that there are 5 open stations with a pan fill level of 8 for burgers.

15 The routine begins with step 160 in which a product type section pointer and a closure priority list pointer are preferably initialized to 1. The product type section pointer selects different product type sections 132 as shown in Figure 4. The product type section pointed to or selected by the product type section pointer is selected in step 162, and each of the sides of the stations are polled to determine whether the  
20 storage location corresponding to the product type selected are open (active) or closed (inactive). The order of polling the storage locations is provided by the closure priority list, which is ordered in an increasing order of priority. Stated differently, those storage locations that have a higher priority of being closed are listed before those storage locations having a lower priority of being closed in the closure priority  
25 list. The number of storage locations to close is calculated in step 164 by subtracting the stock level from the total number of open storage locations for the given product type section. If the number of storage locations to close is a negative number in step 166, none of the storage locations are closed and the product type section pointer is incremented in step 168 to point to the next product type section.

30

If the number of storage locations to close is a positive number in step 166, the storage location indicated by the closure priority list pointer is polled in step 170. If



the polled location is open in step 172, the storage location is closed in step 174, and the number of storage locations to close is decremented in step 176. However, if the storage location is not open in step 172, the number of storage locations to close is decremented in step 176, and the closure priority list pointer is incremented in step 5 178. If the number of storage locations to close is equal to zero in step 180, the product type section pointer is incremented in step 168. However, if the number of storage locations to close is not equal to zero in step 180, the routine returns to step 170 to select the next storage location to poll as indicated by the closure priority list pointer. Following step 168, if the product type section pointer is not equal to 13 in 10 step 182, indicating that the routine has not been performed for each of the 12 product type sections, the routine returns to step 162. However, if the product type section is equal to 13 in step 182, the routine terminates.

Conversely, it is also possible that the demand for one or more food products 15 exceeds the number of storage locations allocated to that food product given a maximum pan fill level for each of the storage locations. In this case, more than one storage location can be assigned to the same prepared food product, and transfers of the food product and the associated storage time can be made between each of these storage locations. Such a transfer is termed a “cross-transfer”, and is not ordinarily 20 permitted during normal operation, but can be programmed in response to increased demand for a particular food product.

The pan fill level represents the desired quantity of food product to be prepared on a per-pan basis. In order to calculate the pan fill level, a food product per 25 unit sale volume is preferably determined, which represents the quantity of a particular food product sold at a predetermined unit of sale volume. For instance, if the unit of sale volume is selected to be \$500 and the quantity of hamburgers sold is 50 when the volume of sale is \$500, then the food product per unit sale volume would be 50. It is anticipated that the food product per unit sale volume will be calculated by sampling 30 actual data under different conditions, such as at different times of the day and different days of the week to establish an acceptable degree of statistical certainty.

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The current activity level is then preferably established as a multiple of the unit of sale volume in dollars. Thus, if the current activity level is \$2000, then the activity level is equal to 4 since the current activity level is four times the unit of sale volume, which is \$500. The food product per unit sale volume is then preferably multiplied by the current activity level and the product is divided by the total number of open pans to yield the pan fill level. Therefore, with a food product per unit sale volume equal to 50, an activity level equal to 4, and the quantity of open pans equal to 2, the pan fill level would preferably be equal to 100.

#### 10      Method of Operation

Figures 9A and 9B show flowcharts of a method for monitoring the status of a food product using the product status and transfer system formed in accordance with the present invention. Upon power-on of the product status and transfer system, all stations enter the active mode wherein all active indicators are illuminated, and all product status indicators are red indicating that the product pans are empty and require product in step 98. The worker then cooks the food product, places the cooked product into the pan in step 100, and places the pan into the station, which is preferably the holding station in step 102. The worker selects the product status switch corresponding to the location in the station just filled until the corresponding product status indicator turns green in step 104 indicating that there is unexpired product in the location just filled. The timer then initiates the count of the storage time by counting down the hold time in step 106 in response to the product status indicator turning green. Preferably following power-on, steps 100-106 will be repeated via step 108 until a sufficient quantity of each of the different products offered for sale is cooked and available at the holding station.

The flowchart continues on Figure 9B with step 110, which determines whether the timer has counted down to zero. If the timer has counted down to zero, the corresponding product status indicators change to flashing slow red in step 112 indicating that the corresponding product has expired and is no longer of acceptable quality. The worker then discards the expired product in step 114, and selects the

corresponding product status switch until the corresponding product status indicator turns red in step 116. The routine continues with step 118, which determines whether cooked product is available, and if it is, the worker selects the transfer switch which triggers the product transfer routine to be performed in step 120. When the transfer  
5 routine has been completed, the routine returns to step 110. If cooked product is not available, the routine returns to step 100 and the worker cooks additional product.

If the timer has not counted down to zero in step 110, the routine determines whether the timer has counted down to the hold time less the cook time in step 122. If  
10 the timer has counted down to the hold time less the cook time, the corresponding product status indicators change from green to yellow in step 124 indicating that the hold time is within the duration of the cook time of expiring and that additional product must be cooked. The routine continues with step 126 wherein the worker removes product from the station and prepares it for sale to the consumer. If the last  
15 food product has been removed from a particular location in step 128, the worker presses the corresponding product status switch and the corresponding product status indicator changes from green or yellow to red in step 130 indicating that the pan is empty and requires product. If cooked product is available in step 118, the product transfer routine is performed in step 120 and the routine continues with step 110. If  
20 cooked product is not available in step 118, the routine continues with step 100, which provides additional cooked product. If the last product has not been removed in step 128, the routine continues with step 110.

#### Detailed Description of Display

25 The display 18 shown in Figure 4 includes a separate product type section 132 corresponding to each upper and lower pan combination found in the stations 12, 14, 16. Thus, the display 18 includes twelve total product type sections 132. Each product type section 132 includes a product name display 134, the product status indicators 44 corresponding to each of the stations 12, 14, 16 and a pan fill level  
30 display 136. It is to be noted that each product type section 132 preferably corresponds to upper and lower pan combinations in each of the stations 12, 14, 16, which are located in the same place on the station 12, 14, 16. For instance, the

product type section 132 located in a first column and a first row of the display 18 corresponds to the upper and lower pan combinations in the first row and the first column of each of the stations 12, 14, 16. Thus, the product described by the product name display 134 in the first row and first column on the display 18, e.g., "Burg", preferably corresponds to the product noted in the product label 46 in the first row and the first column on each of the stations 12, 14, 16.

Similarly, the product status indicators 44 in each of the product type sections 132 on the display 18 correspond to their counterparts on each of the stations 12, 14, 16 and display the same status. For instance, the product status indicators 44 corresponding to the holding station 16 in the product type section 132 in the first column and the first row of the display 18 preferably correspond to the product status indicators 44 in the first column and the first row of the holding station 16. Likewise, the product status indicators 44 in the product type section 132 located in the first row and the first column of the display 18 corresponding to the front counter station 12, preferably correspond to the product status indicators 44 in the first row and the first column of the front counter station 12. Within each product type section 132 there are two product status indicators 44 (upper and lower) for each station 12, 14, 16. The upper product status indicator 44 preferably corresponds to the upper pan for that location in the station 12, 14, 16, and the lower product status indicator preferably corresponds to the lower pan for that location in the station 12, 14, 16.

Thus, the worker 30 responsible for cooking product at the holding station 16 can monitor the status of each of the products at each of the stations by looking at the display 18. In addition, the product status indicators 44 in each of the product type sections 132 are arranged such that the priority for replenishing the food products in each of the corresponding stations preferably decreases from left to right. The product status indicators 44 corresponding to the holding station 16 are positioned the farthest to the left, followed by the product status indicators 44 corresponding to the front counter station 12 and the drive-through station 14. Thus, the holding station 16 is to be refilled before the front counter station 12, which is to be refilled before the drive-through station 14. The pan fill level display 136 indicates the pan fill level for each

product, which is the number of units of each product that should be prepared when new product is cooked.

5 The display 18 also includes an activity level switch 138, a day part switch 140 and an alphanumeric display panel 142 for electronically displaying an activity level and a day part. The activity level is preferably stored in memory. The pan fill level for each of the twelve different products displayed in the product type sections 132 is a function of the activity level, which represents an overall rate of sale for all of the products. Therefore, if the activity level is increased, the pan fill level for each of the products may increase causing additional product to be cooked and ready to meet an increase in demand. The worker can manually adjust the activity level by depressing the activity level switch 138 until the desired activity level is displayed on the alphanumeric display panel 142. The activity level can also be automatically adjusted as a function of the time, the day, promotional events, sales, and the like. A change in the activity level preferably causes changes in the pan fill level for each of the products independently. For example, when changing from activity level 1 to activity level 2, the number of chicken sandwiches can be increased from 6 to 10 whereas the number of burgers can remain at 10.

20 The day part switch 140 can be used to select a desired period of the day, such as morning, afternoon, early evening and late evening. The day part preferably affects the identity of the products shown in the product name displays 134 for each of the product type sections 132. For instance, if the day part is set to morning, typical products shown in the product name displays 134 might be eggs, muffins, sausages, and the like. In contrast, if the day part is set to afternoon, the product name displays 134 might indicate such products as burgers, chicken sandwiches, fish sandwiches, and the like.

30 The day part can be manually modified by activating the day part switch 140, which sequences through the possible values for the day part shown on the alphanumeric display 142 until the desired day part is obtained. The day part can also be automatically modified as a function of the time.

The display 18 includes a menu switch 144, editing cursor switches 146 and an enter switch 148, which enable the product name displays 134, pan fill level displays 136, and potential values for the activity level and day part to be entered and modified by the workers 28, 30 using means well known in the art. An external terminal (not shown) can optionally be connected to the display 18 and used to modify, download and upload versions of operational software, variables, constants, data, and the like as well as editing any of the parameters associated with and/or displayed on the display 18.

#### Circuit Board Level Block Diagram

Figure 10 shows a circuit board level block diagram of the product status and transfer system 10 formed in accordance with the present invention. The product status and transfer system 10 preferably includes six station/worker interface boards (SWIB) 150 for each of the stations 12, 14. Three of the SWIB 150 correspond to the front of the front counter station 12 or drive-through station 14, and three of the SWIB 150 correspond to the rear of the front counter station 12 or drive-through station 14. The holding station 16 preferably requires only three SWIB 150 since the worker 30 accesses only one side of the holding station 150. The SWIB 150 corresponding to each of the stations 12, 14, 16 is indicated by dashed lines surrounding sets of SWIB 150 bearing reference numerals corresponding to the stations 12, 14, 16.

Each station/worker interface board 150 includes four sets of two product status switches 42, two product status indicators 44 and one product label 46 corresponding to each of the four columns in the station 12, 14, 16. Each station 12, 14 also includes two active/transfer boards (ATB) 154. Each ATB 154 has one active switch 34, one active indicator 36, one transfer switch 38 and one transfer indicator 40. The holding station 16 preferably includes only one ATB 154 since only one worker 30 accesses the holding station 150. Each station 12, 14, 16 also includes a station interface board (SIB) 152 electrically coupled to each of the three or six SWIB 150, and one or two ATB 154. Each of the SIB 152 are electrically coupled to a station control board (SCB) 156, which is electrically coupled to a display board 158.

### Detailed Description of Board Level Schematics

5 Tables 2A-2E are parts list for the display board (CDB), station control board (SCB), station interface board (SIB), station worker interface board (SWIB) and active transfer board (ATB), respectively, shown in the circuit board level block diagram of Figure 10.

10 Tables 3A-3E are netlists for the display board (CDB), station control board (SCB), station interface board (SIB), station worker interface board (SWIB) and active transfer board (ATB), respectively, shown in the circuit board level block diagram of Figure 10. The netlists provide a listing of connectivity between components located on the circuit boards according to the reference designations corresponding to the components and pin numbers on the components shown in the schematic diagrams for each of the circuit boards.

# Bill of Material

810191

Title: **PCB Assy, PMS Scoreboard Display**  
 Detail: PCB Assy, *CENTRAL DISPLAY BOARD(CDB)*  
 Rev: **A**  
 Status: **U** Date: 02/05/1999

Item	Qty	Part	Type Stat	Title Detail	Reference
1	1	880289	PL U	LABOR, Protein Status System Protein Status System, Scoreboard, Display Board	
2	1	820006	PS R	Purchased PCB Assy VFD Display 2x20	VFD1
3	1	635-1-20-RA	PS U	Connector Connector, IDC 20 Pin Header Right-Angle	J2
4	1	634042	PS R	Header Header, Dual Row .1 Straight 14 Pos	VFD1
5	1	634014	PS R	Header Header, 8 Pos RT Angle .100	J1
6	1	634-3-2RA	PS U	Header .156 Header, 2 Pos Right Angle .156 Locked	J3
7	12	632040	PS R	IC Socket IC Socket, Low Profile 40 PIN DIP	DS1/DS2 - DS23/ DS24
8	12	632018	PS R	IC Socket IC Socket, Low Profile 18 Pin Wide	DS25-DS36
9	1	620602	PS R	Thermal Pad Thermal Pad TO-220 Sil-Pad-400	VR1
10	1	620504	PS R	Heat Sink Heat Sink, TO220 4.5W	VR1
11	1	550000	PS R	Transistor Transistor, FET 2N7000	Q1
12	1	530062	PS U	Voltage Regulator Voltage Reg, +5 Volt Switching LM2576T-5.0 3ATO220	VR1
13	2	520107	PS R	IC IC, 8bit Latch 74HCT574	U13 U15
14	1	520089	PS R	IC IC, Octal Buffer 74HCT540E Tri State	U14
15	6	520047	PS R	IC IC Led Driver 8 Character ALPHA CC	U1 U2 U3 U4 U5 U6
16	6	520046	PS R	IC IC LED Driver 8 digit Numeric CA, ICM7228AIP1	U7 U8 U9 U10 U11 U12
17	3	520008	PS R	IC IC, Decoder 1 of 8, 74LS138	U16 U17 U18
18	1	510010	PS U	Diode Diode, ShockKey 40V, 3A, 1N5822	CR1
19	12	500025	PS U	Display Display-Green, LED Numeric Dual, Common Anode	DS25 - DS36

TABLE 2A



# Bill of Material

Item	Qty	Part	Type Stat	Title Detail	Reference
20	24	500024	PS U	<b>Display</b> Display, LED Alphanumeric Dual Green CC	DS1 - DS24
21	96	500018	PS R	<b>Display</b> LED, Bi Color Red Green	LD1 - LD84 LD89- LD100
22	8	500004	PS U	<b>Display</b> Display, LED Green T1 3/4	LD85 - LD88 LD101- LD104
23	1	400191	PS R	<b>PCB, Protein Status System</b> PCB, Scoreboard Display Board	
24	18	308-0-0.1UF-50V	PS U	<b>Cap., Ceramic Monolithic, Radial</b> Cap .1uF, 10%, 50V (.2 space)	C1 - C18
25	1	305-4-1000UF-16V	PS U	<b>Cap., Electrolytic Axial</b> Cap 1000uF, 20%, 16V	C21
26	1	305-3-100UF-25V	PS U	<b>Cap., Electrolytic Axial</b> Cap 100uF, 20%, 25V	C19
27	1	190006	PS U	<b>Inductor</b> Inductor, 150 uH Low EMI Torroid	L2
28	1	156103	PS R	<b>SIP Resistor</b> Sip, 9 Res 10K, 10 Pin Bussed	RN1
29	1	10-0-180	PS U	<b>Res. 1/4 W 5% Carbon Film</b> Resistor 180 Ohm 1/4W, 5%	R3
30	5	013408	PS R	<b>Hardware</b> Thread Stnd Off 4-40 1/4 Hex x 1/4 Alu	Processor board mount
31	4	011602	PS U	<b>Hardware</b> Nylon Spacer #6 x .062H x .25 OD - FW	VFD1
32	104	011105	PS U	<b>Display</b> LED Spacer, .175 High,ELM 3-Series 3 lead .100 sp	LD1 - LD104
33	10	002406	PS R	<b>Hardware</b> Screw, 4-40 x 3/16Pan Hd Phil SS SEMS	Processor Board Mount
34	5	002401	PS R	<b>Hardware</b> Nut, 4-40 Keps External Lock SS	VR1, VFD1
35	5	001412	PS R	<b>Hardware</b> Screw, 4-40 x 3/8 Pan Head Phil SS	VR1 VFD1

TABLE 2A

# Bill of Material

810192

Title: **PCB Assy, PMS Scoreboard Processor**

Detail: PCB Assy, *STATION CONTROL BOARD*

Rev: **B**

Status: **U**

Date: 02/05/1999

Item	Qty	Part	Type Stat	Title Detail	Reference
1	1	880290	PL U	LABOR, Protein Status System Protein Status System, Scoreboard, Processor Bd.	
2	1	635-1-20-RA	PS U	Connector Connector, IDC 20 Pin Header Right-Angle	J11
3	1	634-3-2RA	PS U	Header .156 Header, 2 Pos Right Angle .156 Locked	J9
4	0	634-1-6-RA	PS U	Post Header .1 Post Header, Right Angle 6 pos	J10
5	6	633-1-8X8-T	PS U	Modular Jack Modular Jack 8x8 Top Entry Without Stops	J3 J4 J5 J6 J7 J8
6	1	633-8-2.5	PS U	Power Jack DC Power Jack 2.5 MM Panel Mount, PCB Term,PC712	J2
7	1	632040	PS R	IC Socket IC Socket, Low Profile 40 PIN DIP	U1
8	1	620602	PS R	Thermal Pad Thermal Pad TO-220 Sil-Pad-400	VR1
9	1	620504	PS R	Heat Sink Heat Sink, TO220 4.5W	VR1
10	1	600033	PS U	Switch Switch, Slide DPDT ON OFF PCB Mount	S1
11	1	560009	PS U	Crystal Crystal, 11.0592 MHZ HC49USHalf Height	Y1
12	1	560005	PS R	Crystal - S563 Crystal, Quartz 32.768KHZ	Y2
13	0	540-PLD-813	PS U	IC, Surface Mount IC, PSD813F Rom,Ram,I/O	U3
14	1	530008	PS U	Voltage Regulator +5 LM7805 TO220 Case	VR1
15	1	520115	PS R	IC IC, Microprocessor Reset, TO-92, DS1833	Q2
16	1	520112	PS R	IC IC, Oct D Latch Tri State Dip 74ALS573	U2
17	1	520101	PS U	IC IC Microcontroller 16KROM 87C54	U1
18	1	520-M-24C32	PS U	IC, Memory IC EEPROM 4K x 8 Serial 24LC32	U6 do not use U7
19	1	520067	PS R	IC IC Real Time Clock w/ Ram PCF8583PN	U14

TABLE 2B

# Bill of Material

Item	Qty	Part	Type Stat	Title Detail	Reference
20	1	520008	PS R	IC IC, Decoder 1 of 8, 74LS138	U17
21	3	520005	PS R	IC IC RS232 Transmitter and Receiver	U19 U20 U21
22	1	520004	PS R	IC IC HEX Inverter 7406	U5
23	0	520-M-8570	PS U	IC, Memory IC Ram, 256 Byte Static Ram PCF8570	U15
24	1	520-LS-251	PS U	IC 74LS251 Tri-State Data Selectors/Multiplexer	U18
25	1	510012	PS R	Diode Diode Bridge Rectifier MB805 8Amp Bridge(BR6)	CR1
26	1	510007	PS U	Diode Diode, Germanium 1N270	CR6
27	1	500002	PS U	Display Display, LED Red T 1-3/4 - 5mm	LD1
28	1	400192ECN	PS U	PCB, Protein Status System PCB, Scoreboard Processor Board	
29	1	310-0-0.1F-5.5V	PS U	Cap., Gold Cap .1F, +/-30% 5.5V NF Series	C29
30	1	308-2-18PF-100V	PS U	Cap., Ceramic Monolithic Cap, 18pF, 5%, 100V	C25
31	10	308-0-0.1UF-50V	PS U	Cap., Ceramic Monolithic, Radial Cap .1uF, 10%, 50V (.2 space)	C1- C3 C14 C15 C17 - C21
32	18	306-2-10UF-16V	PS U	Cap., Electrolytic, Radial Cap, 10uF, 20%, 16V	C26 C31- C47
33	2	305-3-470UF-35V	PS U	Cap., Electrolytic Axial Cap 470uF, 20%, 35V	C27 C28
34	2	303-2-30PF-500V	PS U	Cap., Dipped Mica Cap 30pF, 5%, 500V	C22 C23
35	2	300000	PS U	Choke Wide Band Shield Bead Ferrite Choke	FB1 FB2
36	1	151472	PS R	SIP Resistor SIP, 9 Res 4.7K 10 Pin Bussed	RN1
37	1	11-3-001.43K	PS U	Resistor, 1/4W 1% Metal Film Resistor, 1.43K 1/4W 1%	R2
38	3	10-3-004.7K	PS U	Res. 1/4 W 5% Carbon Film Resistor 4.7K Ohm 1/4W, 5%	R3 R4 R7
39	1	002401	PS R	Hardware Nut, 4-40 Keps External Lock SS	VR1
40	1	001412	PS R	Hardware Screw, 4-40 x 3/8 Pan Head Phil SS	VR1

TABLE 2 C

**Bill of Material****810195**Title: **PCB Assy, PMS Station Interface**

Detail: PCB Assy,

Rev: **B2**Status: **U**

Date: 06/25/1999

Item	Qty	Part	Type Stat	Title Detail	Reference
1	1	880291	PL U	LABOR, PMS, Station Interface Board PMS, Station Interface Board	
2	0	634-1-6-RA	PS U	Post Header .1 Post Header, Right Angle 6 pos	J7
3	3	633032	PS U	Connector Phone Jack , 6x6 Top Entry Without Stops	J3 J4 J5
4	0	633-8-2.5	PS U	Power Jack DC Power Jack 2.5 MM Panel Mount, PCB Term,PC712	J1
5	1	633-1-8X8-T	PS U	Modular Jack Modular Jack 8x8 Top Entry Without Stops	J2
6	0	633-1-4X4-T	PS U	Modular Jack Modular Jack 4x4 Top Entry	J6
7	1	632040	PS R	IC Socket IC Socket, Low Profile 40 PIN DIP	U1
8	1	560009	PS U	Crystal Crystal, 11.0592 MHZ HC49USHalf Height	Y1
9	0	540-PLD-813	PS U	IC, Surface Mount IC, PSD813F Rom,Ram,I/O	U6
10	1	530055	PS U	Voltage Regulator Switching Regulator LM2574N Dip .5 amp	VR1
11	1	520115	PS R	IC IC, Microprocessor Reset, TO-92, DS1833	Q1
12	1	520044	PS U	IC IC Serial EEPROM , 24C02 256 X 8 No Write prote	U4
13	1	520091	PS R	IC IC Microcontroller P87C52 1 Shot Cmos	U1
14	1	520005	PS R	IC IC RS232 Transmitter and Receiver	U2
15	1	520004	PS R	IC IC HEX Inverter 7406	U5
16	1	510015	PS R	Diode Diode, Schotky 1A 40V 1N5819	D1
17	0	510005	PS U	Diode Diode, Bridge Rectifier 1 Amp	CR1
18	1	510003	PS R	Diode Diode, Rectifier 1N4004	D2
19	2	500002	PS U	Display Display, LED Red T 1-3/4 - 5mm	LD1 LD2

TABLE 2C

# Bill of Material

Item	Qty	Part	Type Stat	Title Detail	Reference
20	1	400195ECN	PS U	PCB, PMS, Station Interface PCB, PMS, Station Interface, Rev. B2	
21	1	311-3-220UF-10V	PS U	Cap., Electrolytic Axial Cap 220uF, 20%, 10V Low ESR	C15
22	1	308-0-0.1UF-50V	PS U	Cap., Ceramic Monolithic, Radial Cap .1uF, 10%, 50V (.2 space)	C4(DO NOT USE C6)
23	5	306-2-10UF-16V	PS U	Cap., Electrolytic, Radial Cap, 10uF, 20%, 16V	C2 C7 C8 C9 C10
24	1	305-3-470UF-35V	PS U	Cap., Electrolytic Axial Cap 470uF, 20%, 35V	C14
25	2	303-2-30PF-500V	PS U	Cap., Dipped Mica Cap 30pF, 5%, 500V	C11 C12
26	1	302-2-10.0UF-16V	PS U	Cap., Tantalum Cap 10uf 10% 16V	C1
27	1	190004	PS R	Inductor 330 uH Coil in plastic enclosure. PE-52627	L1
28	1	151472	PS R	SIP Resistor SIP, 9 Res 4.7K 10 Pin Bussed	RN1
29	1	10-3-004.7K	PS U	Res. 1/4 W 5% Carbon Film Resistor 4.7K Ohm 1/4W, 5%	R1 (DO NOT USE R2 R3)
30	2	10-0-330	PS U	Res. 1/4 W 5% Carbon Film Resistor 330 Ohm 1/4W, 5%	R4 R5
31	2	011606	PS R	Hardware Nylon Spacer .141hole x .188h x .25od	LD1 LD2
32	1	670403	PS R	Wire Wire Cut 24 AWG Buss Wire 2.00"	R6

TABLE 2C

**Bill of Material****810196**Title: **PCB Assy, PMS, Pan Status Keyboard**Detail: **PCB Assy, PMS, Pan Status Keyboard**Rev: **B7**Status: **U**Date: **06/30/1999**

Item	Qty	Part	Type Stat	Title Detail	Reference
1	1	880196	PS U	Labor Labor, Pan Status Keyboard PCB assy.	
2	1	681-6X6-18	PS U	Cable, Tele Flat Pre Made Tele, Flat 6 Cond., 18", 6x6 Modular-Tinned Assy	
3	8	601009	PS U	Switch, Cap, Yellow Switch, Cap, Yellow	SW1-SW8
4	8	600032	PS U	Switch Switch, Momentary Tactile Surface mount On Reel	SW1- SW8
5	3	540-8574	PS U	IC, Surface Mount 8-Bit I/O Expander	U1 U3 U4
6	2	540-2981	PS U	IC, Surface Mount IC, UDN2981LW 8-Channel Source Driver	U2 U5
7	8	500018	PS R	Display LED, Bi Color Red Green	LD1 - LD8
8	1	400196	PS R	PCB, PMS Pan Status Key Board PCB, Pan Status Key Board, Rev. B7	
9	3	313-0-.1UF-25V	PS U	Surface Mount Multilayer Ceramic Chip Cap. Cap .1uF, 25V, +/-10%	C1 C3 C4
10	3	08-3-004.7K	PS U	Surface Mount Thick Film Chip Resistor Resistor, 4.7K, 1/8W, 5%	R17 R18 R19
11	16	08-0-330	PS U	Surface Mount Thick Film Chip Resistor Resistor, 330, 1/8W, 5%,	R1 - R16

TABLE 2D

**Bill of Material****810197**Title: **PCB Assy, PMS, Transfer Keyboard**Detail: PCB Assy, PMS, Transfer Keyboard Rev. C , *ACTIVE TRANSFER BOARD*Rev: **C**Status: **U**

Date: 07/02/1999

Item	Qty	Part	Type Stat	Title Detail	Reference
1	1	880292	PL U	LABOR, PMS, Transfer Keyboard PMS, Transfer Keyboard	
2	1	681-6X6-18	PS U	Cable, Tele Flat Pre Made Tele, Flat 6 Cond., 18", 6x6 Modular-Tinned Assy	
3	3	601009	PS U	Switch, Cap, Yellow Switch, Cap, Yellow	SW1 SW2 SW3
4	2	600032	PS U	Switch Switch, Momentary Tactile Surface mount On Reel	SW1 SW2 SW3
5	1	540-8574	PS U	IC, Surface Mount 8-Bit I/O Expander	U1
6	2	500004	PS U	Display Display, LED Green T1 3/4	LD1 LD2
7	2	500002	PS U	Display Display, LED Red T 1-3/4 - 5mm	LD3
8	1	400197	PS U	PCB, PMS, Transfer Keyboard PCB, PMS, Transfer Keyboard, Rev. C	
9	1	313-0-.1UF-25V	PS U	Surface Mount Multilayer Ceramic Chip Cap. Cap .1uF, 25V, +/-10%	C1
10	1	08-3-004.7K	PS U	Surface Mount Thick Film Chip Resistor Resistor, 4.7K, 1/8W, 5%	R4
11	3	08-0-330	PS U	Surface Mount Thick Film Chip Resistor Resistor, 330, 1/8W, 5%,	R1 R2 R3

*TABLE 2 E*

**TABLE 3A**

net NET00118	U13-1	U5-22
U1-37	C13-B	U5-16
DS1-10	U8-28	U5-31
DS2-10	C8-B	C5-B
DS4-10	U7-28	U6-22
DS3-10	C7-B	U6-16
	U10-28	U6-31
net GND	C10-B	C6-B
U15-10	U9-28	
U15-1	C9-B	Net D1
U14-10	U12-28	U15-3
C15-B	U11-28	U14-17
C14-B	C12-B	VFD1-8
VFD1-1	C11-B	J2-5
C19-2	U1-22	U13-3
CR1-2	U1-16	U8-11
VR1-3	U1-31	U7-11
VR1-5	C1-B	U10-11
C21-MINUS	U2-22	U9-11
J3-2	U2-16	U12-11
Q1-1	U2-31	U11-11
U17-8	C2-B	U1-9
C18-B	U3-22	U2-9
U18-8	U3-16	U3-9
U16-8	U3-31	U4-9
C16-B	C3-B	U5-9
C17-B	U4-22	U6-9
U13-10	U4-16	
	U4-31	Net D3
	C4-B	U15-5



U14-15	U2-12	U11-5
VFD1-10	U3-12	
J2-6	U4-12	Net D5
U13-5	U5-12	U15-7
U8-14	U6-12	U14-13
U7-14		VFD1-12
U10-14	net D7	J2-7
U9-14	U15-9	U13-7
U12-14	U14-11	U8-6
U11-14	VFD1-14	U7-6
U1-11	J2-8	U10-6
U2-11	U13-9	U9-6
U3-11	U8-7	U12-6
U4-11	U7-7	U11-6
U5-11	U10-7	U1-13
U6-11	U9-7	U2-13
	U12-7	U3-13
net D4	U11-7	U4-13
U15-6		U5-13
U14-14	net D6	U6-13
VFD1-11	U15-8	
J2-15	U14-12	Net D2
U13-6	VFD1-13	U15-4
U8-10	J2-14	U14-16
U7-10	U13-8	VFD1-9
U10-10	U8-5	J2-16
U9-10	U7-5	U13-4
U12-10	U10-5	U8-13
U11-10	U9-5	U7-13
U1-12	U12-5	U10-13

U9-13	U15-18	net NET00064
U12-13	J1-8	U14-2
U11-13		RN1-2
U1-10	Net VFD_RS	J1-1
U2-10	VFD1-4	
U3-10	J2-9	net NET00069
U4-10		U14-4
U5-10	Net VFD_RW	RN1-4
U6-10	VFD1-5	J1-3
	J2-12	
net D0		net NET00070
U15-2	Net VFD_ENABLE	U14-5
U14-18	VFD1-6	RN1-5
VFD1-7	Q1-3	J1-4
J2-17	R3-B	
U13-2		net NET00071
U8-12	Net NET00004	U14-6
U7-12	U15-19	RN1-6
U10-12	J1-7	J1-5
U9-12		
U12-12	Net EARTH	net NET00072
U11-12	U14-3	U14-7
U1-8	RN1-3	RN1-7
U2-8	J1-2	
U3-8		net NET00095
U4-8	Net READ_KEY_ROW	U14-8
U5-8	U14-19	RN1-8
U6-8	U14-1	
	U18-15	net NET00096
net NET00020		U14-9



U6-28	net 7SEG_DISP5	U15-20
	U17-11	U14-20
Net NET00104	U11-8	C15-A
U16-7		RN1-1
U13-11	net 7SEG_DISP6	C14-A
	U17-10	VFD1-2
Net	U12-8	L2-1
ALPHA_DISP1_WR		VR1-4
U16-15	net ALPHA_DISP2_WR	C21-PLUS
U1-17	U16-14	U17-16
	U2-17	C18-A
Net NET00036		U18-6
U11-22	net ALPHA_DISP3_WR	U18-16
DS34-13	U16-13	U16-16
LD88-A	U3-17	C16-A
		R3-A
Net 7SEG_DISP1	net ALPHA_DISP4_WR	C17-A
U17-15	U16-12	U13-20
U7-8	U4-17	C13-A
		U8-19
Net 7SEG_DISP2	net ALPHA_DISP5_WR	C8-A
U17-14	U16-11	U7-19
U8-8	U5-17	C7-A
		U10-19
Net 7SEG_DISP3	net ALPHA_DISP6_WR	C10-A
U17-13	U16-10	U9-19
U9-8	U6-17	C9-A
		U12-19
Net 7SEG_DISP4	net +5V	U11-19
U17-12		C12-A
U10-8		

C11-A	net NET00080	net NET00117
U1-1	L2-2	U1-7
U1-15	CR1-1	DS1-12
U1-14	VR1-2	DS2-12
C1-A		DS4-12
U2-1	net NET00000	DS3-12
U2-15	U9-21	
U2-14	LD40-R	net NET00272
C2-A	LD41-R	U7-20
U3-1	LD39-R	LD1-G
U3-15	LD36-R	LD2-G
U3-14	LD37-R	LD3-G
C3-A	LD38-R	LD4-G
U4-1	LD92-R	LD5-G
U4-15	LD42-R	LD6-G
U4-14		LD7-G
C4-A	net +12V	LD89-G
U5-1	C19-1	
U5-15	VR1-1	net NET00157
U5-14	J3-1	U7-23
C5-A		LD1-R
U6-1	net NET00003	LD2-R
U6-15	U9-4	LD3-R
U6-14	LD91-C	LD4-R
C6-A	LD92-C	LD5-R
	LD103-C	LD6-R
net NET00016	LD102-C	LD7-R
U11-17	LD101-C	LD89-R
DS34-14	LD104-C	
LD87-A		

net NET00351	LD11-R	LD2-C
U7-15	LD10-R	DS26-18
DS25-14	LD9-R	DS26-12
	LD8-R	LD9-C
net NET00352	LD90-R	
U7-16		net NET00394
DS25-13	net NET00309	U7-26
	U7-18	DS25-17
net NET00372	LD12-G	DS25-7
U7-17	LD14-G	LD3-C
DS26-14	LD13-G	DS26-17
	LD11-G	DS26-7
net NET00353	LD10-G	LD10-C
U7-4	LD9-G	
DS25-4	LD8-G	net NET00395
DS25-9	LD90-G	U7-2
DS26-4		DS25-1
DS26-9	net NET00392	DS25-5
LD89-C	U7-25	LD4-C
LD90-C	DS25-2	DS26-1
	DS25-6	DS26-5
net NET00373	LD1-C	LD11-C
U7-22	DS26-2	
DS26-13	DS26-6	net NET00396
	LD8-C	U7-1
net NET00308		DS25-3
U7-21	net NET00393	DS25-8
LD12-R	U7-24	LD5-C
LD14-R	DS25-18	DS26-3
LD13-R	DS25-12	DS26-8

LD12-C	DS28-14	DS28-10
net NET00397	net NET00404	LD27-C
U7-3	U8-22	Net NET00426
DS25-15	DS28-13	U8-27
DS25-10		DS27-16
LD6-C	net NET00416	DS27-11
DS26-15	U8-2	LD21-C
DS26-10	DS27-1	DS28-16
LD13-C	DS27-5	DS28-11
	LD18-C	LD28-C
net NET00398	DS28-1	
U7-27	DS28-5	Net NET00427
DS25-16	LD25-C	U8-20
DS25-11		LD15-G
DS26-16	net NET00418	LD16-G
DS26-11	U8-1	LD95-G
LD7-C	DS27-3	LD21-G
LD14-C	DS27-8	LD17-G
	LD19-C	LD18-G
net NET00399	DS28-3	LD20-G
U8-15	DS28-8	LD19-G
DS27-14	LD26-C	
		Net NET00428
net NET00400	net NET00425	U8-23
U8-16	U8-3	LD15-R
DS27-13	DS27-15	LD16-R
	DS27-10	LD95-R
net NET00403	LD20-C	LD21-R
U8-17	DS28-15	LD17-R





DS30-13	DS30-8	
LD104-A		net NET00465
	Net NET00460	U9-18
net NET00002	U9-3	LD40-G
U11-21	DS29-15	LD41-G
LD67-R	DS29-10	LD39-G
LD66-R	LD34-C	LD36-G
LD65-R	LD41-C	LD37-G
LD64-R	DS30-15	LD38-G
LD68-R	DS30-10	LD92-G
LD69-R		LD42-G
LD70-R	Net NET00461	
LD94-R	U9-27	net NET00466
	DS29-16	U9-25
net NET00451	DS29-11	DS29-2
U9-2	LD35-C	DS29-6
DS29-1	DS30-16	LD29-C
DS29-5	DS30-11	LD36-C
LD32-C	LD42-C	DS30-2
LD39-C		DS30-6
DS30-1	Net NET00462	
DS30-5	U9-20	net NET00467
	LD29-G	U9-24
net NET00453	LD30-G	DS29-18
U9-1	LD33-G	DS29-12
DS29-3	LD34-G	LD30-C
DS29-8	LD31-G	LD37-C
LD33-C	LD32-G	DS30-18
LD40-C	LD91-G	DS30-12
DS30-3	LD35-G	

net NET00468	DS31-6	net NET00484
U9-26	LD43-C	U10-2
DS29-17	DS32-2	DS31-1
DS29-7	DS32-6	DS31-5
LD31-C	LD50-C	LD46-C
LD38-C		DS32-1
DS30-17	net NET00478	DS32-5
DS30-7	U10-15	LD53-C
	DS31-14	
net NET00475		net NET00486
U10-26	net NET00479	U10-1
DS31-17	U10-16	DS31-3
DS31-7	DS31-13	DS31-8
LD45-C		LD47-C
DS32-17	net NET00480	DS32-3
DS32-7	U10-17	DS32-8
LD52-C	DS32-14	LD54-C
net NET00476	net NET00481	net NET00489
U10-24	U10-22	U10-23
DS31-18	DS32-13	LD44-R
DS31-12		LD43-R
LD44-C	net NET00482	LD97-R
DS32-18	U10-4	LD47-R
DS32-12	DS31-4	LD49-R
LD51-C	DS31-9	LD48-R
	LD97-C	LD46-R
net NET00477	DS32-4	LD45-R
U10-25	DS32-9	
DS31-2	LD98-C	

net NET00490	U10-18	net NET00498
U10-20	LD53-G	U11-24
LD44-G	LD52-G	DS33-18
LD43-G	LD51-G	DS33-12
LD97-G	LD50-G	LD58-C
LD47-G	LD55-G	DS34-18
LD49-G	LD54-G	DS34-12
LD48-G	LD98-G	LD65-C
LD46-G	LD56-G	
LD45-G		
	net NET00496	net NET00499
net NET00491	U10-21	U11-25
U10-27	LD53-R	DS33-2
DS31-16	LD52-R	DS33-6
DS31-11	LD51-R	LD57-C
LD49-C	LD50-R	DS34-2
DS32-16	LD55-R	DS34-6
DS32-11	LD54-R	LD64-C
LD56-C	LD98-R	
	LD56-R	net NET00018
		U11-16
net NET00492		DS33-13
U10-3	net NET00497	LD86-A
DS31-15	U11-26	
DS31-10	DS33-17	net NET00506
LD48-C	DS33-7	U11-2
DS32-15	LD59-C	DS33-1
DS32-10	DS34-17	DS33-5
LD55-C	DS34-7	DS34-1
	LD66-C	DS34-5
net NET00017		LD60-C

LD67-C	net NET00517	net NET00119
	U11-27	U1-5
net NET00508	DS33-16	DS1-9
U11-1	DS33-11	DS2-9
DS33-3	DS34-16	DS4-9
DS33-8	DS34-11	DS3-9
DS34-3	LD63-C	
DS34-8	LD70-C	net NET00536
LD61-C		U12-24
LD68-C	net NET00518	DS35-18
	U11-3	DS35-12
net NET00535	DS33-15	LD72-C
U12-26	DS33-10	DS36-18
DS35-17	DS34-15	DS36-12
DS35-7	DS34-10	LD79-C
LD73-C	LD62-C	
DS36-17	LD69-C	net NET00537
DS36-7		U12-25
LD80-C	net NET00015	DS35-2
	U11-23	DS35-6
net NET00516	LD59-R	LD71-C
U11-20	LD58-R	DS36-2
LD59-G	LD57-R	DS36-6
LD58-G	LD63-R	LD78-C
LD57-G	LD93-R	
LD63-G	LD61-R	net NET00538
LD93-G	LD62-R	U12-15
LD61-G	LD60-R	DS35-14
LD62-G		
LD60-G		net NET00539











U2-40	U3-21	U3-7
DS5-2	DS11-16	DS9-12
DS6-2		DS10-12
DS8-2	net NET00185	DS12-12
DS7-2	U3-20	DS11-12
	DS11-11	
Net NET00179		net NET00191
U2-39	net NET00186	U3-6
DS5-4	U3-19	DS9-7
DS6-4	DS12-16	DS10-7
DS8-4		DS12-7
DS7-4	net NET00187	DS11-7
	U3-18	
Net NET00180	DS12-11	net NET00192
U3-26		U3-2
DS9-16	net NET00188	DS9-1
	U3-37	DS10-1
Net NET00181	DS9-10	DS12-1
U3-25	DS10-10	DS11-1
DS9-11	DS12-10	
	DS11-10	net NET00193
Net NET00182		U3-35
U3-24	net NET00189	DS9-18
DS10-16	U3-5	DS10-18
	DS9-9	DS12-18
Net NET00183	DS10-9	DS11-18
U3-23	DS12-9	
DS10-11	DS11-9	net NET00194
		U3-3
Net NET00184	net NET00190	DS9-13

DS10-13	DS11-14	net NET00203
DS12-13		U4-26
DS11-13	net NET00199	DS13-16
	U3-4	
net NET00195	DS9-5	net NET00204
U3-38	DS10-5	U4-25
DS9-6	DS12-5	DS13-11
DS10-6	DS11-5	
DS12-6		net NET00205
DS11-6	net NET00200	U4-24
	U3-34	DS14-16
net NET00196	DS9-8	
U3-33	DS10-8	net NET00206
DS9-17	DS12-8	U4-23
DS10-17	DS11-8	DS14-11
DS12-17		
DS11-17	net NET00201	net NET00207
	U3-40	U4-21
net NET00197	DS9-2	DS15-16
U3-36	DS10-2	
DS9-15	DS12-2	net NET00208
DS10-15	DS11-2	U4-20
DS12-15		DS15-11
DS11-15	net NET00202	
	U3-39	net NET00209
net NET00198	DS9-4	U4-19
U3-32	DS10-4	DS16-16
DS9-14	DS12-4	
DS10-14	DS11-4	net NET00210
DS12-14		U4-18

DS16-11	net NET00215	DS13-17
	U4-2	DS14-17
Net NET00211	DS13-1	DS16-17
U4-37	DS14-1	DS15-17
DS13-10	DS16-1	
DS14-10	DS15-1	net NET00220
DS16-10		U4-36
DS15-10	net NET00216	DS13-15
	U4-35	DS14-15
Net NET00212	DS13-18	DS16-15
U4-5	DS14-18	DS15-15
DS13-9	DS16-18	
DS14-9	DS15-18	net NET00221
DS16-9		U4-32
DS15-9	net NET00217	DS13-14
	U4-3	DS14-14
Net NET00213	DS13-13	DS16-14
U4-7	DS14-13	DS15-14
DS13-12	DS16-13	
DS14-12	DS15-13	net NET00222
DS16-12		U4-4
DS15-12	net NET00218	DS13-5
	U4-38	DS14-5
Net NET00214	DS13-6	DS16-5
U4-6	DS14-6	DS15-5
DS13-7	DS16-6	
DS14-7	DS15-6	net NET00223
DS16-7		U4-34
DS15-7	net NET00219	DS13-8
	U4-33	DS14-8

DS16-8	U5-23	DS20-9
DS15-8	DS18-11	DS19-9
net NET00224	net NET00230	Net NET00236
U4-40	U5-21	U5-7
DS13-2	DS19-16	DS17-12
DS14-2		DS18-12
DS16-2	net NET00231	DS20-12
DS15-2	U5-20	DS19-12
	DS19-11	
net NET00225		Net NET00237
U4-39	net NET00232	U5-6
DS13-4	U5-19	DS17-7
DS14-4	DS20-16	DS18-7
DS16-4		DS20-7
DS15-4	net NET00233	DS19-7
	U5-18	
net NET00226	DS20-11	Net NET00238
U5-26		U5-2
DS17-16	net NET00234	DS17-1
	U5-37	DS18-1
net NET00227	DS17-10	DS20-1
U5-25	DS18-10	DS19-1
DS17-11	DS20-10	Net NET00239
	DS19-10	U5-35
net NET00228		DS17-18
U5-24	net NET00235	DS18-18
DS18-16	U5-5	DS20-18
	DS17-9	DS19-18
net NET00229	DS18-9	





U6-34	net NET00032	
DS21-8	J1-8	
DS22-8	S4-2	
DS24-8	S5-2	
DS23-8	S6-2	
	S7-2	
Net NET00270	S8-2	
U6-40		
DS21-2	net NET00054	
DS22-2	J1-1	
DS24-2	S4-1	
DS23-2		
	net EARTH	
Net NET00271	J1-2	
U6-39	S1-1	
DS21-4	S5-1	
DS22-4		
DS24-4	net NET00003	
DS23-4	J1-7	
	S1-2	
Net NET00052	S2-2	
J1-3	S3-2	
S2-1		
S6-1	net NET00034	
	J1-5	
Net NET00051	S8-1	
J1-4		
S7-1		
S3-1		

**TABLE 3B**

net VCC	C31-1	U1-20
C15-A	U18-16	C22-B
U15-1	C18-A	C23-B
U15-8	U17-6	U3-1
R4-B	C17-A	U3-16
R3-B	C19-A	U3-26
U7-1	U19-16	Q2-1
U7-2	C34-2	C26-2
CR6-2	C35-1	U6-1
U1-31	C20-A	U6-3
U1-40	C39-2	U6-7
U3-38	C40-1	C45-2
U3-15	U17-16	C1-B
Q2-3	U5-14	C3-B
C26-1	U2-20	U2-1
U6-2	U6-8	C2-B
C45-1	U7-8	CR1-3
C1-A		U20-15
C3-A	net GND	C21-B
C2-A	C14-B	U21-15
RN1-1	U14-3	C46-2
R7-B	U14-4	C47-1
U20-16	C29-2	C27-MINUS
C21-A	C15-B	VR1-2
U21-16	U15-2	C28-MINUS
C44-2	U15-3	C31-2
C46-1	U15-7	R2-A
VR1-3	U15-4	U18-8
	U7-3	C18-B
	U7-7	C17-B



C19-B	J8-7	U18-7
U19-15	J9-2	U17-5
C35-2	U17-8	
C36-1	U5-7	net NET00159
C20-B	U2-10	U20-14
C40-2	U6-4	J5-6
C41-1	U7-4	
J5-3		net NET00160
J5-1	net RS232_ADDR0	U21-13
J5-5	U1-1	J7-2
J5-7	U18-11	
J4-3	U17-1	net TXD
J4-1		U1-11
J4-5	net RS232_ADDR1	U17-4
J4-7	U1-2	
J3-3	U18-10	net NET00073
J3-1	U17-2	U19-6
J3-5		C36-2
J3-7	net RS232_ADDR2	
J6-3	U1-3	net NET00074
J6-1	U18-9	C32-2
J6-5	U17-3	U19-3
J6-7		
J7-3	net WRITE_LATCH_1	net NET00076
J7-1	R7-A	C33-1
J7-5	U5-6	U19-4
J7-7	J11-10	
J8-3		net +12V
J8-1	net RS232_CE	CR1-4
J8-5	U1-4	C27-PLUS

VR1-1	U19-14	net NET00047
C28-PLUS	J3-6	U20-4
LD1-A		C38-1
J5-4	net NET00009	
J5-8	U19-13	net NET00145
J4-4	J3-2	U17-15
J4-8		U19-11
J3-4	net NET00016	
J3-8	U19-7	net NET00049
J6-4	J4-6	U20-1
J6-8		C37-1
J7-4	net NET00029	
J7-8	U20-11	net NET00050
J8-4	U17-13	U20-5
J8-8		C38-2
J9-1	net NET00030	
	U20-12	net NET00051
net NET00005	U18-2	U20-2
C32-1		C39-1
U19-1	net NET00044	
	U20-6	net NET00150
net NET00006	C41-2	U18-4
U19-2		U19-12
C34-1	net NET00028	
	U19-8	net NET00112
net NET00007	J4-2	U20-10
C33-2		U17-12
U19-5	net NET00045	
	U20-3	net NET00054
net NET00008	C37-2	



net NET00037	U1-36	U2-7
CR1-1	U3-33	RN1-7
FB2-2	U2-5	J11-7
FB2-3	RN1-5	
	J11-6	Net D2
net NET00072		U1-37
FB1-2	net D4	U3-32
FB1-3	U1-35	U2-4
S1-2	U3-34	RN1-4
S1-5	U2-6	J11-16
	RN1-6	
net NET00011	J11-15	Net D0
FB1-1		U1-39
FB1-4	net D7	U3-30
J2-1	U1-32	U2-2
	U3-37	RN1-2
net NET00012	U2-9	J11-17
FB2-1	RN1-9	
FB2-4	J11-8	Net A0
J2-3		U3-29
	net D6	U2-19
net D1	U1-33	J11-1
U1-38	U3-36	
U3-31	U2-8	Net NET00064
U2-3	RN1-8	U14-6
RN1-3	J11-14	U15-6
J11-5		R3-A
	net D5	U7-6
net D3	U1-34	U1-14
	U3-35	U6-6



U1-26	Y2-1	
U3-44	C25-B	
	U14-1	
net NET00010		
U1-25	Net NET00019	
U3-43	U1-22	
	U3-40	
net NET00017		
U1-24	Net NET00000	
U3-42	C25-A	
	C14-A	
net NET00018	U14-8	
U1-23	C29-1	
U3-41	CR6-1	
net NET00274	Net NET00031	
U1-18	U1-28	
Y1-2	U3-46	
C23-A		
	Net ALE	
net NET00041	U1-30	
U1-29	U3-10	
U3-49	U2-11	
net NET00277	Net NET00043	
U1-19	Y2-2	
C22-A	U14-2	
Y1-1		
net NET00033		

**TABLE 3C**

net GND	U6-26	U1-2
CR1-3	C6-B	RN1-3
SW1-2	J3-5	J3-4
U4-1	J3-6	
U4-3	J4-5	Net SDATA
U4-7	J4-6	U4-5
Q1-1	J5-5	U1-8
U1-20	J5-6	RN1-9
VR1-4	J6-4	
VR1-2	U5-7	Net NET00028
VR1-3	U4-4	CR1-1
D1-2		J1-1
C15-2	net NET00000	
C14-MINUS	SW1-1	Net NET00032
C4-B	R1-B	U1-15
J2-3	U5-11	U5-5
J2-1		U5-1
J2-5	net NET00001	
J2-7	U5-10	Net NET00036
U2-10	U1-14	U5-12
U2-8		U6-48
U2-15	net NET00002	
C7-1	LD2-C	Net NET00037
C2-2	U5-4	U1-11
C1-2		U2-11
C11-B	net NET00003	
C12-B	J2-6	Net VCC
U6-1	U2-13	R1-A
U6-16		U4-2
	net NET00043	Q1-3

U1-31	J4-4	U6-30
U1-40		
VR1-1	net EE_SCLK	net NET00040
L1-2	U4-6	U1-38
L1-4	U1-7	U6-31
C15-1	RN1-8	
C4-A		net NET00041
U2-16	net NET00005	U1-37
C8-2	U1-1	U6-32
C2-1	RN1-2	
C1-1	J3-3	net NET00044
U6-38		U1-36
U6-15	net NET00008	U6-33
C6-A	CR1-4	
RN1-1	VR1-5	net NET00045
R6-B	D2-1	U1-35
R5-A	C14-PLUS	U6-34
R4-A		
R3-A	net NET00006	net NET00046
R2-A	U1-3	U1-34
U5-14	RN1-4	U6-35
U4-8	J4-3	
		net NET00026
Net NET00038	net RESET	U1-5
U1-10	Q1-2	RN1-6
U2-12	U1-9	J5-3
	U5-13	
Net NET00042		net NET00031
U1-4	net NET00039	U1-6
RN1-5	U1-39	RN1-7





Y1-2	C9-2	R2-B
C12-A		U5-9
	net NET00076	U5-6
Net NET00277	U2-4	J6-1
U1-19	C10-1	
Y1-1		net NET00267
C11-A	net +12V	CR1-2
	D2-2	J1-3
Net NET00138	J2-4	
U2-1	J2-8	net NET00010
C9-1		VR1-6
	net NET00020	VR1-8
Net NET00143	LD1-C	
U2-2	U5-3	net NET00013
C8-1	U5-2	VR1-7
		L1-1
Net NET00069	net NET00022	L1-3
U2-5	R4-B	D1-1
C10-2	LD1-A	
Net NET00070	net NET00025	
J2-2	R5-B	
U2-14	LD2-A	
Net NET00073	net NET00027	
U2-6	R3-B	
C7-2	U5-8	
	J6-2	
Net NET00074		
U2-3	net NET00030	

**TABLE 3D**

Net NET00000	LD3-C	U2-18
U2-1	LD4-C	R1-B
U1-4	J1-1	
	J2-2	Net NET00009
net NET00001		U2-17
U2-2	net NET00002	R2-B
U1-5	U2-3	
	U1-6	Net NET00012
net GND		U2-13
J1-5	net NET00003	R6-B
U3-1	U2-5	
U3-8	U1-9	Net NET00015
C3-B		R14-A
SW1-3	net NET00004	LD7-G
SW1-4	U2-7	
SW2-3	U1-11	Net NET00025
SW2-4		R3-A
SW3-3	net NET00005	LD2-R
SW3-4	U2-4	
SW4-3	U1-7	Net NET00027
SW4-4		R7-A
U2-10	net NET00006	LD4-R
U1-2	U2-6	
U1-1	U1-10	Net NET00029
U1-8		R11-A
C1-B	net NET00007	LD6-R
LD1-C	U2-8	
LD2-C	U1-12	Net NET00031
		R16-A
	net NET00008	LD8-G

net NET00034 U5-8 U4-12	U3-4 SW1-1 SW1-2	U4-6  net NET00049 U5-2 U4-5
net NET00035 U5-6 U4-10	net NET00040 U5-12 R15-B	net NET00045 U5-17 R10-B
net NET00036 U5-7 U4-11	net NET00041 U5-14 R13-B	net NET00052 U3-5 SW2-1 SW2-2
net NET00037 U5-5 U4-9	net NET00042 U5-18 R9-B	net NET00053 U3-6 SW3-1 SW3-2
net NET00033 U5-1 U4-4	net NET00043 U2-14 R5-B	net NET00054 U3-7 SW4-1 SW4-2
net NET00038 U5-11 R16-B	net NET00044 U5-16 R11-B	net NET00055 U3-9 J2-6
net NET00039 U5-13 R14-B	net NET00047 U5-4 U4-7	net NET00056
net NET00051	net NET00048 U5-3	

U3-10	U5-10	R17-A
J2-7	U4-2	J2-1
	U4-8	
net SCLK	C4-B	net NET00016
J1-3	J4-5	R1-A
U3-14	SW5-3	LD1-R
U1-14	SW5-4	
R17-B	SW6-3	net NET00017
J2-4	SW6-4	R2-A
	SW7-3	LD1-G
net NET00068	SW7-4	
U3-11	SW8-3	net NET00018
J2-8	SW8-4	R5-A
	LD5-C	LD3-R
net SDATA	LD6-C	
J1-4	LD7-C	net NET00019
R18-B	LD8-C	R9-A
U3-15	J4-1	LD5-R
U1-15	J3-2	
J2-5		net NET00020
	net VCC	U2-12
net VCC_1	J1-2	R7-B
U5-9	R18-A	
U4-16	U3-16	net NET00021
U4-1	U3-2	R6-A
C4-A	C3-A	LD3-G
J4-2	U2-9	
J3-1	U1-16	net NET00022
	C1-A	R10-A
net GND-COM	R19-A	LD5-G

net NET00023	R12-A	
U2-11	LD6-G	
R8-B		
	net NET00032	
net NET00010	R15-A	
U2-16	LD8-R	
R3-B		
	net NET00014	
net NET00011	U5-15	
U2-15	R12-B	
R4-B		
	net FRONT/~BACK	
net NET00013	J1-6	
U3-12	U3-3	
J2-9	U1-3	
	R19-B	
net NET00024	J2-3	
R13-A		
LD7-R	net NET00050	
	U4-14	
net NET00026	J4-3	
R4-A	J3-4	
LD2-G		
	net NET00057	
net NET00028	U4-3	
R8-A	J4-6	
LD4-G	J3-3	
	net NET00060	
net NET00030	U4-15	

**TABLE 3E**

	net GND: C1-B, J1-5, J1-1, U1-8, SW1-3, SW1-4, SW2-3, SW2-4, SW3-3, SW3-4,
	net NET00001: J1-6, R4-B, U1-3
	net VCC: R1-A, R3-A, R2-A, C1-A, J1-2, R4-A, U1-16, U1-2, U1-1
5	net NET00002: J1-4, U1-15
	net NET00003: J1-3, U1-14
	net NET00006: U1-4, LD1-C
	net NET00007: LD2-C, U1-5
	net NET00008: LD3-C, U1-6
10	net NET00009: R1-B, LD1-A
	net NET00010: R2-B, LD2-A
	net NET00011: R3-B, LD3-A
	net NET00012: U1-10, SW3-1, SW3-2
	net NET00013: U1-9, SW2-1, SW2-2
15	net NET00014: U1-7, SW1-1, SW1-2

Station/Worker Interface Board

Figure 11 is a schematic diagram of the station/worker interface board (SWIB) 150 shown in Figure 10. The SWIB 150 includes serially-addressable ports PCF8574T U1, U3, U4, drivers UDN2982LW U2, U5, LED's LD1-LD8, 330 ohm resistors R1-R16, 4.7k ohm resistors R17-R19, 0.1uF capacitor C1, C3, C4 and switches SW1-SW8. The LED's LD1-LD8 correspond to the product status indicators 44 on the SWIB 150, and the switches SW1-SW8 correspond to the product status switches 42 on the SWIB 150.

A connector J1 provides electrical connection between selected signals on the SWIB 150 and the station interface board (SIB) 152. The serially-addressable ports PCF8574T U1, U3, U4 and the drivers UDN2982LW U2, U5 enable control of the product status indicators 44, and monitoring of the product status switches 42 via serialized data to and from the SIB 152. Groups of two LED's and two switches, such as LED's LD1-LD2 and switches SW1-SW2 correspond to one column on one of the stations 12, 14, 16. The 4.7k ohm resistors R17, R18 and R19 are used to pull the

corresponding signals up to VCC, and the 0.1uF capacitors C1, C3, C4 provide bypass capacitance for the SWIB 150.

The connector J1 for the SWIB 150 corresponding to the front of the station  
5 and the connector J1 for the SWIB 150 corresponding to the rear of station are  
connected to a modular T-connector (not shown) , such as those used for telephones.  
A front/back signal coupled to connector J1 provides a unique address, which  
determines whether the corresponding SWIB 150 corresponds to the front or rear of  
the station. In the preferred embodiment, the pin on connector J1 corresponding to the  
10 front/back signal on the front SWIB 150 is cut, and since the front/back signal is  
pulled up to VCC on the SWIB 150, this SWIB 150 corresponds to the front of the  
station. Similarly, the front/back signal on the SWIB 150 corresponding to the rear of  
the station is tied to ground, which indicates that this SWIB 150 corresponds to the  
rear of the station. Thus, the preferred embodiment is advantageous in that the  
15 front/back signal is not required for the SWIB 150 corresponding to the front of the  
station, which results in a significant reduction in the number of wires between the  
SWIB 150 and the SIB 152.

#### Remapping of Product Status Switches

20 Figures 8D and 8E show the display 18 mounted facing the front of the  
holding station 16 and the rear of the holding station 16, respectively. It is preferred  
that the position of a given product type section 132 on the display 18 spatially  
corresponds to one of the upper and lower tray combinations on the holding station 16  
as shown by dashed lines A on Figure 8D. Each of the upper and lower tray  
25 combinations includes the product status indicators 42, product status switches 44,  
product label 46 and upper and lower trays 48. It is sometimes desirable to mount the  
display 18 facing the rear of the holding station 16 if, for instance, access to an ac  
outlet can only be obtained by doing so. When this is done, the product type sections  
132 on the display no longer correspond spatially to the correct upper and lower tray  
30 combinations as shown by dashed lines B on Figure 8E. However, by remapping the  
addresses of the serially addressable ports PCF8574T U1-U3 the spatial  
correspondence shown in Figure 8D can again be achieved. This remapping can be



achieved through software in the operational program of the SIB 152 or the SCB 156 based upon a switch selected by the user to indicate whether the display 18 is mounted facing the front of the holding station 16 or the rear of the holding station 16.

#### 5           Active/Transfer Board

Figure 12 is a schematic diagram of the active/transfer board (ATB) 154. The ATB 154 includes connector J1, LED's LD1-LD3, 330 ohm resistors R1-R3 and switches SW1-SW3. The switches SW1-SW3 correspond to the active switch 34A, for the front of the station, the active switch 34B for the rear of the station and the transfer switch 38, respectively. The LED's LD1-LD3 correspond to the active indicator 36A for the front of the station, the active switch 36B for the rear of the station, and the transfer indicator 40, respectively. The 330 ohm resistors R1-R3 limit the series current seen by the LED's LD1-LD3, and the connector J1 provides electrical connection between the ATB 154 and the SIB 152. A serially-addressable port PCF8574A7 U1 is electrically connected to and disposed between the connector J1 and the switches SW1-SW3 and LED's LD1-LD3. The serially-addressable port PCF85747 U1 enables the SIB 152 to access each of the switches and LED's via a serial data and address stream.

#### 20           Station Interface Board

Figure 13 is a schematic diagram of the station interface board (SIB) 152. The SIB 152 includes a microcontroller 80C32A U1, which monitors and controls the SIB 152, the ATB 154 and the SWIB 150. A serial data bus is pulled up to VCC using a 4.7k ohm resistor pack RN1. Three sets of serial ports, which are electrically connected to three connectors J3-J5, enable the microcontroller 80C32A U1 to monitor the product status switches 44 located on the SWIB 150.

The combination of an 11.059MHz crystal Y1 and 30 pF capacitors C11, C12 provide a clock signal to the microcontroller 80C32A U1. A reset circuit DS1833-10 provides a reset signal having the required rise time, fall time and duration to the microcontroller 80C32A U1. A serial interface MAX 232 U2 and 10uF capacitors C7-C10 in electrical connection thereto, provide an RS-232 bidirectional serial

interface between the microcontroller 80C32A U1 on the SIB 152 and components on the station control board 156 via a connector J2.

A set of capacitors C1, C2, C4, C5 provide bypass capacitance, and a 4.7k ohm resistor R1-R3 is used to pull corresponding signals up to VCC. An inverter 7406 U10 is used to logically invert the reset signal before being applied to a memory device PSD813F U8, which provides external RAM and ROM for the microcontroller 80C32A U1. A set of LED's LD1, LD2 provide a visual indication of the day part, and whether the microcontroller 80C32A U1 is running, which is also provided to an optional warmer daypart temperature select board (not shown) via a connector J6. A set of 330 ohm resistors R4, R5 are used to limit the series current seen by the LED LD1, LD2 and inverters 7405 U5 provide the necessary drive current.

Connectors J3-J5 provide electrical connection between signals on the SIB 152 and those on each of up to six SWIB 150 and two ATB 154. A voltage regulator LM2575T-5.0 VR1, L1, diodes D1, D2, a 470uF capacitor C14, a 220uF capacitor C15, and a bridge rectifier CR1 provide regulation of a 12 volt supply to a 5 volt VCC via a connector J1 on the SIB 152. A programmable read only memory (PROM) 24C164 U4 provides additional permanent memory storage for the microcontroller 80C32A U1.

#### Station Control Board

Figures 14A and 14B are schematic diagrams for the station control board (SCB) 156. The SCB 156 is substantially similar to the SIB 152 with the exception of an additional bank of serial PROM 24C164 U6, U7 and a serial RAM PCF8570 U15, which provide additional external memory for the microcontroller 80C32 U1. A time-of-day clock PCF8583 U14 in combination with a 32.768KhZ oscillator Y2, a 0.1uF capacitors C29, C14 an 18pF capacitor C25 and a diode 1N270 CR5 provide a battery-backed time of day to the microcontroller 80C32 U1 to permit, for instance, automated control of the day part and the activity level.

The schematic diagram for the SCB 156 continues on Figure 14B with a decoder 74LS138 U17 and a multiplexer 74LS251N U18, which provide address decoding and data directivity for three bidirectional serial channels provided by a set of serial interfaces MAX232 U19-U21, and 10uF capacitors C32-C47 which are electrically connected to connectors J3-J8. The connectors J3-J8 then connect to J2 on Figure 13 of the SIB 153. A connector J11 on the SCB 156 provides electrical connection between signals such as the data bus on the SCB 156 and the display board 158.

A connector J2 provides a 12v ac power signal from the display board to ferrite beads FB1, FB2, a switch S1, a bridge rectifier CR1, 470μF capacitors C27, C28, an LED LD1 and a 1.43k ohm resistor R2, which convert the 12v ac power signal to a 12v dc power signal. The 12v dc power signal is regulated down to 5v dc by a voltage regulator LM7805CT VR1 and a 10μF capacitor C31. The 12v dc power signal is also provided to the display board via a connector J9. The remaining components shown in Figures 14A and 14B and their associated functions and connectivity are substantially similar to those described above for the SIB 152 shown in Figure 13.

#### Display Board

The display board 158 is shown in Figures 15A-15L. The connector J11 on the station control board 156 shown in Figure 14A is coupled to a connector J2 on the display board 158 shown in Figure 15A, and provides the multiplexed address and data bus to decoders 74LS138 U16-U18, latches 74HCT574 U13, U15 and a buffer 74HCT540 U14. The outputs of the buffer 74HCT540 U14 are pulled up to VCC with a 10K ohm resistor pack RN1. These devices along with a transistor 2N7000 Q1 and a 180 ohm resistor R3 enable control of the displays and indicators located on the display board 158 shown in Figures 15C-15K, as well as a vacuum fluorescent display VFD1 shown in Figure 15A, by the station control board 156. A set of 0.1μF capacitors C1-C18 provide bypass capacitance for the devices on the display board 158.

The vacuum fluorescent display VFD1 shown in Figure 15A corresponds to the alphanumeric display 142 shown in Figure 4. Groups of four 14-segment displays LTP3784E DS1-DS24 shown in Figures 15C-15H correspond to one product name display 134 shown in Figure 4. Each of the 14-segment displays LTP3784E DS1-DS24 is capable of indicating two alphanumeric digits. The decoders, latches and buffer shown in Figures 15A and 15B are electrically connected to six 14-segment drivers ICM7243B U1-U6 shown in Figures 15C and 15H. These drivers provide the signals required by the 14-segment displays LTP3784 DS1-DS24 to display the identities of the different products sold. It is to be noted that there are twelve groups of four 14-segment displays LTP3784E DS1-DS24 shown in Figures 15C and 15H, which correspond to the twelve product name displays 134 on Figure 4.

Figures 15I and 15K show the pan fill level display 136 and the product status indicators 44 located on the display 18 as shown in Figure 4. Twelve groups of two 7-segment displays LN524RA DS25-DS36 correspond to the twelve pan fill level displays 136 shown in Figure 4. Likewise, groups 160 of eight LED's LD1-LD100 correspond to the product status indicators 44 in each product type section 132 shown in Figure 4. For instance, LED LD1 on Figure 15I corresponds to the product status indicator 44 in the first column and upper first row in the front counter station 12, and LED LD2 corresponds to the product status indicator 44 corresponding to the first column and lower first row in the front counter station 12. Six 7-segment display drivers ICM7228A U7-U12 are electrically connected to the decoders, latches and buffer shown in Figures 15A and 15B, and provide signals required for the LED's LD1-LD100 and the 7-segment displays LN524RA DS25-DS36 to display the status and the pan fill levels for each product, respectively.

Figure 16F is a schematic diagram of the activity level switch 138, the day part select switch 140, the menu switch 144, the editing cursor switches 146 and the enter switch 148 shown in the lower portion of the display 18 on Figure 4. Each of the switches include two terminals interconnected in a column and row matrix and provided as signals via a connector J1 to the buffer 74HCT540 U14 and the latch 74HCT574 U15 shown in Figure 15A. The microcontroller 80C32 U1 on the SCB

156 can readily determine which of the switches was selected by accessing the buffer and latch by means well known in the art.

#### Additional Embodiments

- 5           The product status indicators 44 may include a liquid crystal display (LCD) or light emitting diode (LED) display, which is used to display the current value of the storage time for the corresponding food product. The worker may then use the storage time to determine whether a particular action should be taken with respect to the corresponding food product, such as cooking replenishment product or discarding the
- 10   product.

- Although illustrative embodiments of the present invention have been described herein with reference to the accompanying drawing, it is to be understood that the invention is not limited to those precise embodiments, and that various other
- 15   changes and modifications may be effected therein by one skilled in the art without departing from the scope or spirit of the invention.

**WHAT IS CLAIMED IS:**

1. A method for monitoring the status and storage location of a prepared food product in a restaurant, which comprises the steps of:
  - a. supplying a prepared food product to a storage location, the storage location having associated therewith a food product status indicator, the food product status indicator having at least a first state which indicates that the prepared food product is stored at the associated storage location, at least a second state which indicates that the prepared food product is not stored at the associated storage location and at least a third state which indicates that a storage time exceeds an acceptable food product hold time;
  - b. changing the state of the food product status indicator associated with the storage location from the second state to the first state in response to the prepared food product being supplied to the storage location;
  - c. initiating a storage timer in response to the food product status indicator changing from the second state to the first state, the storage timer counting the storage time representative of the duration of time that the prepared food product has been stored at the storage location;
  - d. comparing the storage time with the acceptable food product hold time;
  - e. changing the state of the food product status indicator associated with the storage location to the third state if the storage time exceeds the acceptable food product hold time; and
  - f. changing the state of the food product status indicator associated with the storage location from the first state to the second state in response to the storage location no longer containing the prepared food product.
2. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 1, wherein the food product status indicator has at least a fourth state which indicates that the cooking of a replenishment

food product should commence, and wherein the method further comprises the steps of:

g. comparing the storage time with a cook start time, the cook start time being equal to the difference between the acceptable food product hold time and the time required to cook the replenishment food product; and

h. changing the state of the food product status indicator associated with the storage location to the fourth state in response to the storage time exceeding the cook start time.

3. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 1, further comprising the step of displaying the state of the food product status indicator on a display, the display being located remotely from the storage location.

4. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 1, wherein the storage location has an active switch associated therewith, wherein the food product status indicator has at least a seventh state which indicates that the storage location is not being used, the method further comprising the step of changing the state of the food product status indicator to the seventh state in response to activation of the active switch.

5. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 1, wherein the food product status indicator has at least a seventh state which indicates that the storage location is not being used, the method further comprising the step of changing the state of the food product status indicator to the seventh state in response to at least one of a time, a day and an event.

6. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 1, further comprising the step of providing a pan fill level associated with the storage location, the pan fill level indicating a

quantity of the prepared food product to cook in response to the state of the food product status indicator changing to the second state.

7. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 6, further comprising the step of displaying the pan fill level on a display, the display being located remotely from the storage location.

8. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 6, further comprising the steps of:

i. electronically displaying an activity level associated with the storage location, the activity level indicating a rate of sale of the prepared food product; and

j. changing the pan fill level as a function of the activity level.

9. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 8, further comprising the step of storing the activity level in a memory.

10. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 8, wherein the storage location has an activity level switch associated therewith, further comprising the step of changing the activity level in response to activation of the activity level switch.

11. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 8, further comprising the step of changing the activity level in response to at least one of a time, a day and an event.

12. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 8, further comprising the step of displaying the activity level on a display, the display being located remotely from the storage location.



13. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 6, further comprising the steps of:

k. providing a selectable menu associated with the storage location, the selectable menu having associated therewith at least one pan fill level; and

l. electronically displaying the selectable menu on a display, the display being located remotely from the storage location.

14. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 6, wherein the step of providing a pan fill level further comprises the steps of:

m. calculating a food product per unit sale volume, the food product per unit sale volume being representative of a quantity of food product sold at a unit sale volume, the unit sale volume being representative of a volume of sale in dollars;

n. determining an activity level, the activity level being representative of a quantity of unit sale volume substantially equal to a current volume of sale; and

o. multiplying the food product per unit sale volume by the activity level and dividing the product of the food product per unit sale volume and the activity level by a quantity of open pans to yield the pan fill level.

15. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 13, wherein the storage location has a selectable menu switch associated therewith, the method further comprising the step of changing the selectable menu in response to activation of the selectable menu switch.

16. In a method for monitoring the status and storage location of a prepared food product in a restaurant wherein the prepared food product is removed from a source

storage location and transferred to a destination storage location, wherein the improvement comprises the steps of:

- a. supplying a prepared food product to a source storage location, the source storage location having at least a source food product status indicator and a source food product transfer mode associated therewith, the source food product status indicator having at least a first state which indicates that the prepared food product is stored at the associated source storage location, at least a second state which indicates that the prepared food product is not stored at the associated source storage location and at least a third state which indicates that a source storage time exceeds an acceptable food product hold time;
- b. changing the state of the source food product status indicator from the second state to the first state in response to the prepared food product being supplied to the source storage location;
- c. initiating a source storage timer associated with the source storage location in response to the source food product status indicator changing from the second state to the first state, the source storage timer counting a source storage time representative of the duration of time that the prepared food product has been stored at the source storage location;
- d. selecting the source food product transfer mode, the destination storage location having at least a destination food product status indicator and a destination food product transfer mode associated therewith, the destination food product status indicator having at least a first state which indicates that the prepared food product is stored at the associated destination storage location, at least a second state which indicates that the prepared food product is not stored at the associated destination storage location and at least a third state which indicates that a cumulative storage time exceeds the acceptable food product hold time;
- e. changing the state of the source food product status indicator from the first state to the second state in response to the prepared food product being removed from the source storage location and the source food product transfer mode being selected;
- f. selecting the destination food product transfer mode;

- g. changing the state of the destination food product status indicator from the second state to the first state in response to the prepared food product being supplied to the destination storage location and the destination food product transfer mode being selected;
- h. initiating a destination storage timer associated with the destination storage location in response to the destination food product status indicator changing from the second state to the first state, the destination storage timer counting the cumulative storage time representative of the duration of time that the prepared food product has been stored at the source storage location and the destination storage location;
- i. comparing the destination storage time with the acceptable food product hold time; and
- j. changing the state of the destination food product status indicator to the third state in response to the cumulative storage time exceeding the acceptable food product hold time.

17. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 16, wherein the destination food product status indicator has at least a fourth state which indicates that the cooking of a replenishment food product should commence, and wherein the method further comprises the steps of:

- k. comparing the cumulative storage time with a cook start time, the cook start time being equal to the difference between the acceptable food product hold time and the time required to cook the replenishment food product; and
- l. changing the state of the destination food product status indicator to the fourth state in response to the cumulative storage time exceeding the cook start time.

18. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 16, further comprising the step of displaying the state of at least one of the source food product status indicator and the destination food product status indicator on a display, the display being located

remotely from at least one of the source storage location and the destination storage location.

19. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 16, wherein at least one of the source storage location and the destination storage location has an active switch associated therewith, wherein at least one of the source food product status indicator and the destination food product status indicator has at least a seventh state which indicates that at least one of the source storage location and the destination storage location is not being used, the method further comprising the step of changing the state of at least one of the source food product status indicator and the destination food product status indicator to the seventh state in response to activation of the active switch.

20. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 16, at least one of the source food product status indicator and the destination food product status indicator has at least a seventh state which indicates that at least one of the source storage location and the destination storage location is not being used, the method further comprising the step of changing the state of at least one of the source food product status indicator and the destination food product status indicator to the seventh state in response to at least one of a time, a day and an event.

21. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 16, further comprising the step of providing a pan fill level associated with at least one of the source storage location and the destination storage location, the pan fill level indicating a quantity of the prepared food product to cook in response to the state of at least one of the source food product status indicator and the destination food product status indicator changing to the second state.

22. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 21, further comprising the step of



o. providing a selectable menu associated with at least one of the source storage location and the destination storage location, the selectable menu having associated therewith at least one pan fill level; and

p. electronically displaying the selectable menu on a display, the display being located remotely from at least one of the source storage location and the destination storage location.

29. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 21, wherein the step of providing a pan fill level further comprises the steps of:

q. calculating a food product per unit sale volume, the food product per unit sale volume being representative of a quantity of food product sold at a unit sale volume, the unit sale volume being representative of a volume of sale in dollars;

r. determining an activity level, the activity level being representative of a quantity of unit sale volume substantially equal to a current volume of sale; and

s. multiplying the food product per unit sale volume by the activity level and dividing the product of the food product per unit sale volume and the activity level by a quantity of open pans to yield the pan fill level.

30. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 28, wherein at least one of the source storage location and the destination storage location has a selectable menu switch associated therewith, the method further comprising the step of changing the selectable menu in response to activation of the selectable menu switch.

31. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 16, further comprising the step of positioning the source storage location and the destination storage location in substantially similar spatial locations in different stations.

32. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 16, wherein the destination food product indicator has at least a sixth state which indicates that the food product can be transferred into the associated destination storage location, the method further comprising the step of changing the state of the destination food product status indicator to the sixth state in response to selecting the destination food product transfer mode.

33. In a method for monitoring the status and storage location of a prepared food product in a restaurant wherein the prepared food product is removed from a first source storage location and transferred to a destination storage location, wherein the improvement comprises the steps of:

a. supplying a prepared food product to a first source storage location, the first source storage location having a first source food product status switch, a first source food product status indicator and a source food product transfer mode associated therewith, the source food product transfer mode being associated with a first source product location, the first source food product status indicator having at least a first state which indicates that the prepared food product is stored at the associated first source storage location, at least a second state which indicates that the prepared food product is not stored at the associated first source storage location, at least a third state which indicates that a first source storage time for the associated first source storage location exceeds an acceptable food product hold time and at least a fifth state which indicates which of the first source storage location and the second source storage location has a longer storage time associated therewith;

b. changing the state of the first source food product status indicator from the second state to the first state in response to the prepared food product being supplied to the first source storage location;

c. initiating a first source storage timer associated with the first source storage location in response to the first source food product status indicator changing from the second state to the first state, the first source storage timer counting a first source storage time representative of the duration of time that the prepared food product has been stored at the first source storage location;

d. supplying the prepared food product to the second source storage location following the step of initiating the first source storage timer, the second source storage location having a second source food product status switch, a second source food product status indicator and the source food product transfer mode associated therewith, the second source food product status indicator having at least a first state which indicates that the prepared food product is stored at the associated second source storage location, at least a second state which indicates that the prepared food product is not stored at the associated second source storage location, at least a third state which indicates that a second source storage time for the associated second source storage location exceeds the acceptable food product hold time and at least a fifth state which indicates which of the first source storage location and the second source storage location has a longer storage time associated therewith;

e. changing the state of the second source food product status indicator from the second state to the first state in response to the prepared food product being supplied to the second source storage location;

f. initiating a second source storage timer associated with the second source storage location in response to the second source food product status indicator changing from the second state to the first state, the second source storage timer counting a second source storage time representative of the duration of time that the prepared food product has been stored at the associated second source storage location;

g. selecting the source food product transfer mode associated with the first and second source storage locations;

h. selecting the first source food product status switch associated with the first source storage location;

i. changing the state of the first source food product status indicator to the fifth state in response to the source food product transfer mode being selected the destination storage location having a destination food product status switch, a destination food product status indicator and a destination food product transfer mode associated therewith, the destination food product status indicator having at least a first state which indicates that the prepared food product is stored at the associated destination storage location, at least a second state which indicates that



the prepared food product is not stored at the associated destination storage location and least a third state which indicates that a cumulative storage time exceeds the acceptable food product hold time;

j. changing the state of the first source food product status indicator from the first state to the second state in response to the prepared food product being removed from the first source storage location;

- k. selecting the destination food product transfer mode;

1. selecting the destination food product status switch;

m. changing the state of the destination food product status indicator from the second state to the first state in response to the prepared food product being supplied to the destination storage location;

n. initiating the destination storage timer in response to the destination food product status indicator changing from the second state to the first state, the destination storage timer counting the cumulative storage time representative of the duration of time that the prepared food product has been stored at the first source storage location and the destination storage location

- o. comparing the cumulative storage time with the acceptable food product hold time; and

p. changing the state of the destination food product status indicator to the third state in response to the cumulative storage time exceeding the acceptable food product hold time.

34. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 33, wherein the destination food product status indicator has at least a fourth state which indicates that the cooking of a replenishment food product should commence, and wherein the method further comprises the steps of:

q. comparing the cumulative storage time with a cook start time, the cook start time being equal to the difference between the acceptable food product hold time and the time required to cook the replenishment food product; and

r. changing the state of the destination food product status indicator to the fourth state in response to the cumulative storage time exceeding the cook start time.

35. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 33, further comprising the step of displaying the state of at least one of the first source food product status indicator, the second source food product status indicator and the destination food product status indicator on a display, the display being located remotely from at least one of the first source storage location, the second source storage location and the destination storage location.

36. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 33, wherein at least one of the first source storage location, the second source storage location and the destination storage location has an active switch associated therewith, wherein at least one of the first source food product status indicator, second source food product status indicator and destination food product status indicator has at least a seventh state which indicates that at least one of the first source storage location, the second source storage location and the destination storage location is not being used, the method further comprising the step of changing the state of at least one of the first source food product status indicator, the second source food product status indicator and the destination food product status indicator to the seventh state in response to activation of the active switch.

37. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 33, wherein the first source food product status indicator, the second source food product status indicator and the destination food product status indicator has at least a seventh state which indicates that at least one of the first source storage location, the second source storage location and the destination storage location is not being used, the method further comprising the step of changing the state of at least one of the first source food product status indicator,

the second source food product status indicator and the destination food product status indicator to the seventh state in response to at least one of a time, a day and an event.

38. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 33, further comprising the step of providing a pan fill level associated with at least one of the first source storage location, the second source storage location and the destination storage location, the pan fill level indicating a quantity of the prepared food product to cook in response to the state of at least one of the first source food product status indicator, the second source food product status indicator and the destination food product status indicator changing to the second state.

39. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 38, further comprising the step of displaying the pan fill level on a display, the display being located remotely from at least one of the first source storage location, the second source storage location, and the destination storage location.

40. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 38, further comprising the steps of:

s. electronically displaying an activity level associated with at least one of the first source storage location, the second source storage location and the destination storage location, the activity level indicating a rate of sale of the prepared food product; and

t. changing the pan fill level as a function of the activity level.

41. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 40, further comprising the step of storing the activity level in a memory.

42. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 40, wherein at least one of the first source

storage location, the second source storage location and the destination storage location has an activity level switch associated therewith, further comprising the step of changing the activity level in response to activation of the activity level switch.

43. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 40, further comprising the step of changing the activity level in response to at least one of a time, a day and an event.

44. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 40, further comprising the step of displaying the activity level on a display, the display being located remotely from at least one of the first source storage location, the second source storage location and the destination storage location.

45. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 38, further comprising the steps of:

u. providing a selectable menu associated with at least one of the first source storage location, the second source storage location and the destination storage location, the selectable menu having associated therewith at least one pan fill level; and

v. electronically displaying the selectable menu on a display, the display being located remotely from at least one of the first source storage location, the second source storage location and the destination storage location.

46. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 38, wherein the step of providing a pan fill level further comprises the steps of:

w. calculating a food product per unit sale volume, the food product per unit sale volume being representative of a quantity of food product sold at a unit sale volume, the unit sale volume being representative of a volume of sale in dollars;

x. determining an activity level, the activity level being representative of a quantity of unit sale volume substantially equal to a current volume of sale; and

y. multiplying the food product per unit sale volume by the activity level and dividing the product of the food product per unit sale volume and the activity level by a quantity of open pans to yield the pan fill level.

47. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 45, wherein the at least one of the first source storage location, the second source storage location and the destination storage location has a selectable menu switch associated therewith, the method further comprising the step of changing the selectable menu in response to activation of the selectable menu switch.

48. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 33, further comprising the step of positioning at least one of the first source storage location, the second source storage location and the destination storage location in substantially similar spatial locations in different stations.

49. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 33, wherein the destination food product indicator has at least a sixth state which indicates that the food product can be transferred into the associated destination storage location, the method further comprising the step of changing the state of the destination food product status indicator to the sixth state in response to selecting the destination food product transfer mode.

50. A method for monitoring the status and storage location of a prepared food product in a restaurant as defined by Claim 36, further comprising the steps of:

z. calculating a quantity of open source storage locations, the source storage location being open when the associated food product status indicator



the food product status indicator having at least a third state which indicates that the storage time exceeds an acceptable food product hold time, the processing circuit comparing the storage time with the acceptable food product hold time, the state of the food product status indicator associated with the storage location changing to the third state in response to the storage time exceeding the acceptable food product hold time.

52. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 51, wherein the food product status indicator has at least a fourth state which indicates that the cooking of a replenishment food product should commence, wherein the processing circuit compares the storage time with a cook start time, the cook start time being equal to the difference between the acceptable food product hold time and the time required to cook the replenishment food product, and wherein the state of the food product status indicator associated with the storage location is changed to the fourth state in response to the storage time exceeding the cook start time.

53. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 51, further comprising a display, the display indicating the state of the food product status indicator associated with the storage location, the display being located remotely from the storage location.

54. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 51, further comprising an active switch associated with the storage location, wherein the food product status indicator has at least a seventh state which indicates that the storage location is not being used, the state of the food product status indicator changing to the seventh state in response to activation of the active switch.

55. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 51, wherein the food product status indicator has at least a seventh state which indicates that the storage





62. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 58, further comprising a display, the display being located remotely from the storage location, the activity level being displayed on the display.

63. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 56, further comprising a display and a selectable menu associated with the storage location, the selectable menu having associated therewith a pan fill level, the selectable menu being electronically displayed on the display.

64. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 63, wherein the storage location has a selectable menu switch associated therewith, the selectable menu changing in response to activation of the selectable menu switch.

65. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 51, wherein the storage location has a food product pan associated therewith, at least one of the food product status switch and the food product status indicator being located in alignment with the food product pan.

66. In a product status system which monitors the status and storage location of a prepared food product wherein at least a portion of the prepared food product is removed from a source storage location and transferred to a destination storage location, wherein the improvement comprises:

a processing circuit;

a source food product status switch associated with a source storage location, the source food product status switch being coupled to the processing circuit;

means for selecting a source food product transfer mode associated with the source storage location, the means for selecting the source food product transfer mode being coupled to the processing circuit;

a source food product status indicator associated with the source storage location, the source food product status indicator being coupled to the processing circuit, the source food product status indicator having at least a first state which indicates that the prepared food product is stored at the associated source storage location and at least a second state which indicates that the prepared food product is not stored at the associated source storage location, the state of the source food product status indicator changing from the second state to the first state in response to the prepared food product being supplied to the source storage location and the source food product status switch being selected, the state of the source food product status indicator changing from the first state to the second state in response to the source storage location no longer containing prepared food product and the source food product status switch being selected;

a source storage timer associated with the source storage location, the source storage timer being coupled to the processing circuit, the source storage timer being initiated in response to the source food product status indicator changing from the second state to the first state, the source storage timer counting a source storage time, the source storage time being representative of the duration of time that the prepared food product has been stored at the source storage location, the source food product status indicator having at least a third state which indicates that the source storage time exceeds an acceptable food product hold time, the processing circuit comparing the source storage time with the acceptable food product hold time, the state of the source food product status indicator changing to the third state in response to the source storage time exceeding the acceptable food product hold time;

a destination food product status switch associated with a destination storage location, the destination food product status switch being coupled to the processing circuit;

means for selecting a destination food product transfer mode associated with the destination storage location, the means for selecting the destination food product transfer mode being coupled to the processing circuit;

a destination food product status indicator associated with the destination storage location, the destination food product status indicator being coupled to the processing circuit, the destination food product status indicator having at least a first state which indicates that the prepared food product is stored at the associated destination storage location and at least a second state which indicates that the prepared food product is not stored at the associated destination storage location, the state of the destination food product status indicator changing from the second state to the first state in response to the prepared food product being supplied to the destination storage location and the destination food product status switch being selected, the state of the destination food product status indicator changing from the first state to the second state in response to the destination storage location no longer containing prepared food product and the destination food product status switch being selected; and

a destination storage timer associated with the destination storage location, the destination storage timer being coupled to the processing circuit, the destination storage timer being initiated in response to the destination food product status indicator changing from the second state to the first state, the destination storage timer counting a cumulative storage time, the cumulative storage time being representative of the duration of time that the prepared food product has been stored at the source storage location and the destination storage location, the destination food product status indicator having at least a third state which indicates that the cumulative storage time exceeds the acceptable food product hold time, the processing circuit comparing the cumulative storage time with the acceptable food product hold time, the state of the destination food product status indicator changing to the third state in response to the cumulative storage time exceeding the acceptable food product hold time.

67. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 66, wherein the destination food product status indicator has at least a fourth state which indicates that the cooking of a replenishment food product should commence, the processing circuit comparing the cumulative storage time with a cook start time, the cook start time

being equal to the difference between the acceptable food product hold time and the time required to cook the replenishment food product, the state of the destination food product status indicator changing to the fourth state in response to the cumulative storage time exceeding the cook start time.

68. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 66, further comprising a display, the display indicating the state of at least one of the source food product status indicator and the destination food product status indicator, the display being located remotely from at least one of the source storage location and the destination storage location.

69. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 66, further comprising an active switch associated with at least one of the source storage location and the destination storage location, wherein at least one of the source food product status indicator and the destination food product status indicator has at least a seventh state which indicates that at least one of the source storage location and the destination storage location is not being used, the state of at least one of the source food product status indicator and the destination food product status indicator changing to the seventh state in response to activation of the active switch.

70. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 66, wherein at least one of the source food product status indicator and the destination food product status indicator has at least a seventh state which indicates that at least one of the source storage location and the destination storage location is not being used, the state of at least one of the source food product status indicator and the destination food product status indicator changing to the seventh state in response to at least one of a time, a day and an event.

71. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 66, further comprising a pan fill level associated with at least one of the source storage location and the destination storage location, the pan fill level indicating a quantity of the prepared food product to cook in response to the state of at least one of the source food product status indicator and the destination food product status indicator changing to the second state.

72. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 71, further comprising a display, the display being located remotely from at least one of the source storage location and the destination storage location, the pan fill level being displayed on the display.

73. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 71, further comprising an activity level associated with at least one of the source storage location and the destination storage location, the activity level indicating a rate of sale of the prepared food product, the pan fill level changing as a function of the activity level.

74. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 73, further comprising a memory, the activity level being stored in the memory.

75. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 73, further comprising an activity level switch associated with at least one of the source storage location and the destination storage location, the activity level switch changing in response to activation of the activity level switch.

76. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 73, wherein the activity level is changed in response to at least one of a time, a day and an event.

77. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 73, further comprising a display, the display being located remotely from at least one of the source storage location and the destination storage location, the activity level being displayed on the display.

78. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 71, further comprising a display and a selectable menu associated with at least one of the source storage location and the destination storage location, the selectable menu having associated therewith a pan fill level, the selectable menu being electronically displayed on the display.

79. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 78, wherein at least one of the source storage location and the destination storage location has a selectable menu switch associated therewith, the selectable menu changing in response to activation of the selectable menu switch.

80. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 66, wherein the source storage location and the destination storage location are positioned in substantially similar spatial locations in different stations.

81. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 66, wherein the destination food product status indicator has at least a sixth state which indicates that the prepared food product can be transferred into the destination storage location, the state of the destination food product status indicator changing to the sixth state in response to the source food product transfer mode and the destination food product status switch being selected.

82. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 66, wherein at least one of the source storage location and the destination storage location has a food product pan associated therewith, at least one of the source food product status switch, the destination food product status switch, the source food product status indicator and the destination food product status indicator being located in alignment with the food product pan.

83. In a product status system which monitors the status and storage location of a prepared food product wherein at least a portion of the prepared food product is removed from a first source storage location and transferred to a destination storage location, wherein the improvement comprises:

a processing circuit;

a first source food product status switch associated with a first source storage location, the first source food product status switch being coupled to the processing circuit;

means for selecting a source food product transfer mode associated with the first source storage location and a second source storage location, the means for selecting the first source food product transfer mode being coupled to the processing circuit;

a first source food product status indicator associated with the first source storage location, the first source food product status indicator being coupled to the processing circuit, the first source food product status indicator having at least a first state which indicates that the prepared food product is stored at the associated first source storage location and at least a second state which indicates that the prepared food product is not stored at the associated first source storage location, the state of the first source food product status indicator changing from the second state to the first state in response to the prepared food product being supplied to the first source storage location and the first source food product status switch being selected, the state of the first source food product status indicator changing from the first state

to the second state in response to the first source storage location no longer containing prepared food product and the first source food product status switch being selected;

a first source storage timer associated with the first source storage location, the first source storage timer being coupled to the processing circuit, the first source storage timer being initiated in response to the first source food product status indicator changing from the second state to the first state, the first source storage timer counting a first source storage time, the first source storage time being representative of the duration of time that the prepared food product has been stored at the first source storage location, the first source food product status indicator having at least a third state which indicates that the first source storage time exceeds an acceptable food product hold time, the processing circuit comparing the first source storage time with the acceptable food product hold time, the state of the first source food product status indicator changing to the third state in response to the first source storage time exceeding the acceptable food product hold time, the first source food product status indicator having at least a fifth state which indicates which of the first source storage location and the second storage location has the longest storage time associated therewith, the processing circuit comparing the first source storage time with a second source storage time, the state of that source food product status indicator associated with the source food product location having the longest storage time associated therewith changing to the fifth state in response to the source food product transfer mode being selected;

a second source food product status switch associated with the second source storage location, the second source food product status switch being coupled to the processing circuit;

a second source food product status indicator associated with the second source storage location, the second source food product status indicator being coupled to the processing circuit, the second source food product status indicator having at least a first state which indicates that the prepared food product is stored at the associated second source storage location and at least a second state which indicates that the prepared food product is not stored at the associated second source storage location, the state of the second source food product status indicator changing from the second state to the first state in response to the prepared food product being



supplied to the second source storage location and the second source food product status switch being selected, the state of the second source food product status indicator changing from the first state to the second state in response to the second source storage location no longer containing prepared food product and the second source food product status switch being selected;

a second source storage timer associated with the second source storage location, the second source storage timer being coupled to the processing circuit, the second source storage timer being initiated in response to the second source food product status indicator changing from the second state to the first state, the second source storage timer counting the second source storage time, the second source storage time being representative of the duration of time that the prepared food product has been stored at the second source storage location, the second source food product status indicator having at least a third state which indicates that the second source storage time exceeds an acceptable food product hold time, the processing circuit comparing the second source storage time with the acceptable food product hold time, the state of the second source food product status indicator changing to the third state in response to the second source storage time exceeding the acceptable food product hold time, the first source food product status indicator having at least a fifth state which indicates which of the first source storage location and the second source storage location has the longest storage time associated therewith, the processing circuit comparing the first source storage time with the second source storage time, the state of that food product status indicator associated with the source food product location having the longest storage time associated therewith changing to the fifth state in response to the source food product transfer mode being selected;

a destination food product status switch associated with a destination storage location, the destination food product status switch being coupled to the processing circuit;

means for selecting a destination food product transfer mode associated with the destination storage location, the means for selecting the destination food product transfer mode being coupled to the processing circuit;

a destination food product status indicator associated with the destination storage location, the destination food product status indicator being

coupled to the processing circuit, the destination food product status indicator having at least a first state which indicates that the prepared food product is stored at the associated destination storage location and at least a second state which indicates that the prepared food product is not stored at the associated destination storage location, the state of the destination food product status indicator changing from the second state to the first state in response to the prepared food product being supplied to the destination storage location and the destination food product status switch being selected, the state of the destination food product status indicator changing from the first state to the second state in response to the destination storage location no longer containing prepared food product and the destination food product status switch being selected; and

a destination storage timer associated with the destination storage location, the destination storage timer coupled to the processing circuit, the destination storage timer being initiated in response to the destination food product status indicator changing from the second state to the first state, the first source storage time being longer than the second source storage time, the first source food product status switch and the destination food product transfer mode, the destination storage timer counting a cumulative storage time, the cumulative storage time being representative of the duration of time that the prepared food product has been stored at the first source storage location and the destination storage location, the destination food product status indicator having at least a third state which indicates that the cumulative storage time exceeds the acceptable food product hold time, the processing circuit comparing the cumulative storage time with the acceptable food product hold time, the state of the destination food product status indicator being changed to the third state in response to the cumulative storage time exceeding the acceptable food product hold time.

84. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 83, wherein the destination food product status indicator has at least a fourth state which indicates that the cooking of a replenishment food product should commence, the processing circuit comparing the cumulative storage time with a cook start time, the cook start time

being equal to the difference between the acceptable food product hold time and the time required to cook the replenishment food product, the state of the destination food product status indicator changing to the fourth state in response to the storage time exceeding the cook start time.

85. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 83, further comprising a display, the display indicating the state of at least one of the first source food product status indicator, the second source food product status indicator and the destination food product status indicator, the display being located remotely from at least one of the first source food product location, the second source food product location and the destination food product location.

86. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 83, further comprising an active switch associated with the first source storage location, wherein the first source food product status indicator has at least a seventh state which indicates that the first source storage location is not being used, the state of the first source food product status indicator changing to the seventh state in response to activation of the active switch.

87. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 83, wherein the first source food product status indicator has at least a seventh state which indicates that the first source storage location is not being used, the state of the first source food product status indicator changing to the seventh state in response to at least one of a time, a day and an event.

88. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 83, further comprising a pan fill level associated with the first source storage location, the pan fill level indicating a

quantity of the prepared food product to cook in response to the state of the first source food product status indicator changing to the second state.

89. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 88, further comprising a display, the display being located remotely from the first source storage location, the pan fill level being displayed on the display.

90. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 88, further comprising an activity level associated with the first source storage location, the activity level indicating a rate of sale of the prepared food product, the pan fill level changing as a function of the activity level.

91. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 90, further comprising a memory, the activity level being stored in the memory.

92. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 90, further comprising an activity level switch associated with the first source storage location, the activity level switch changing in response to activation of the activity level switch.

93. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 90, wherein the activity level is changed in response to at least one of a time, a day and a promotional event.

94. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 90, further comprising a display, the display being located remotely from the first source storage location, the activity level being displayed on the display.

95. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 88, further comprising a display and a selectable menu associated with at least one of the first source storage location, the second source storage location and the destination storage location, the selectable menu having associated therewith a pan fill level, the selectable menu being electronically displayed on the display.

96. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 95, wherein at least one of the first source storage location, the second source storage location and the destination storage location has a selectable menu switch associated therewith, the selectable menu changing in response to activation of the selectable menu switch.

97. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 83, wherein the first source storage location and the destination storage location are positioned in substantially similar spatial locations in different stations.

98. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 83, wherein the destination food product status indicator has at least a sixth state which indicates that the prepared food product can be transferred into the destination storage location, the state of the destination food product status indicator changing to the sixth state in response to the source food product transfer mode and the destination food product status switch being selected.

99. A product status system which monitors the status and storage location of a prepared food product in a restaurant as defined by Claim 83, wherein at least one of the first source storage location, the second source storage location and the destination storage location has a food product pan associated therewith, at least one of the first source food product status switch, second source food product status switch, destination food product status switch, first source food product status indicator,

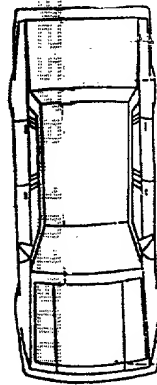
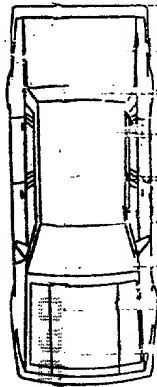
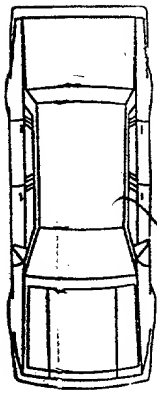
second source food product status indicator and destination food product status indicator being located in alignment with the food product pan.

## **ABSTRACT OF THE DISCLOSURE**

A system and method is provided for monitoring a status of a plurality of products, such as prepared food, located in product locations within stations throughout a restaurant. The status of each product indicates whether that product exists in a particular storage location, and whether that product has exceeded its shelf life or hold time. The storage time which has elapsed for each product is automatically counted and compared to the hold time. A cook time, which is that duration of time required to cook a particular product, is also maintained for each of the products. The status indicates when additional product should be cooked in order to have new product prior to the expiration of existing product by indicating when the hold time less the cook time has elapsed. The status also indicates which product is the oldest to facilitate the transfer and use of the oldest product first. A transfer of one product to another product location automatically transfers the corresponding elapsed storage time with that product.

78879\_1.DOC

20



EXIT ONLY

22

28

DRIVE-THROUGH  
STATION

14

28

28

FRONT COUNTER  
STATION

12

28

CENTRAL  
DISPLAY

18

HOLDING  
STATION

16

32

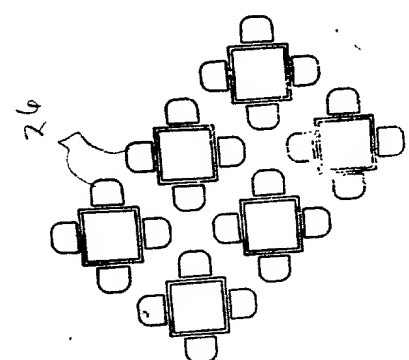
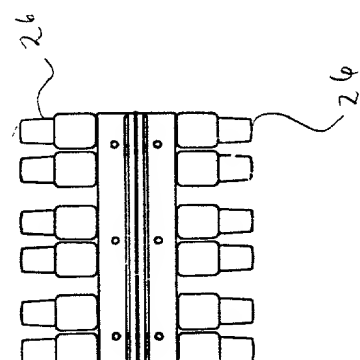
28

FRONT COUNTER  
STATION

12

28

30



CASH  
REGISTER

CASH  
REGISTER

FIGURE 1



00692378 1015000

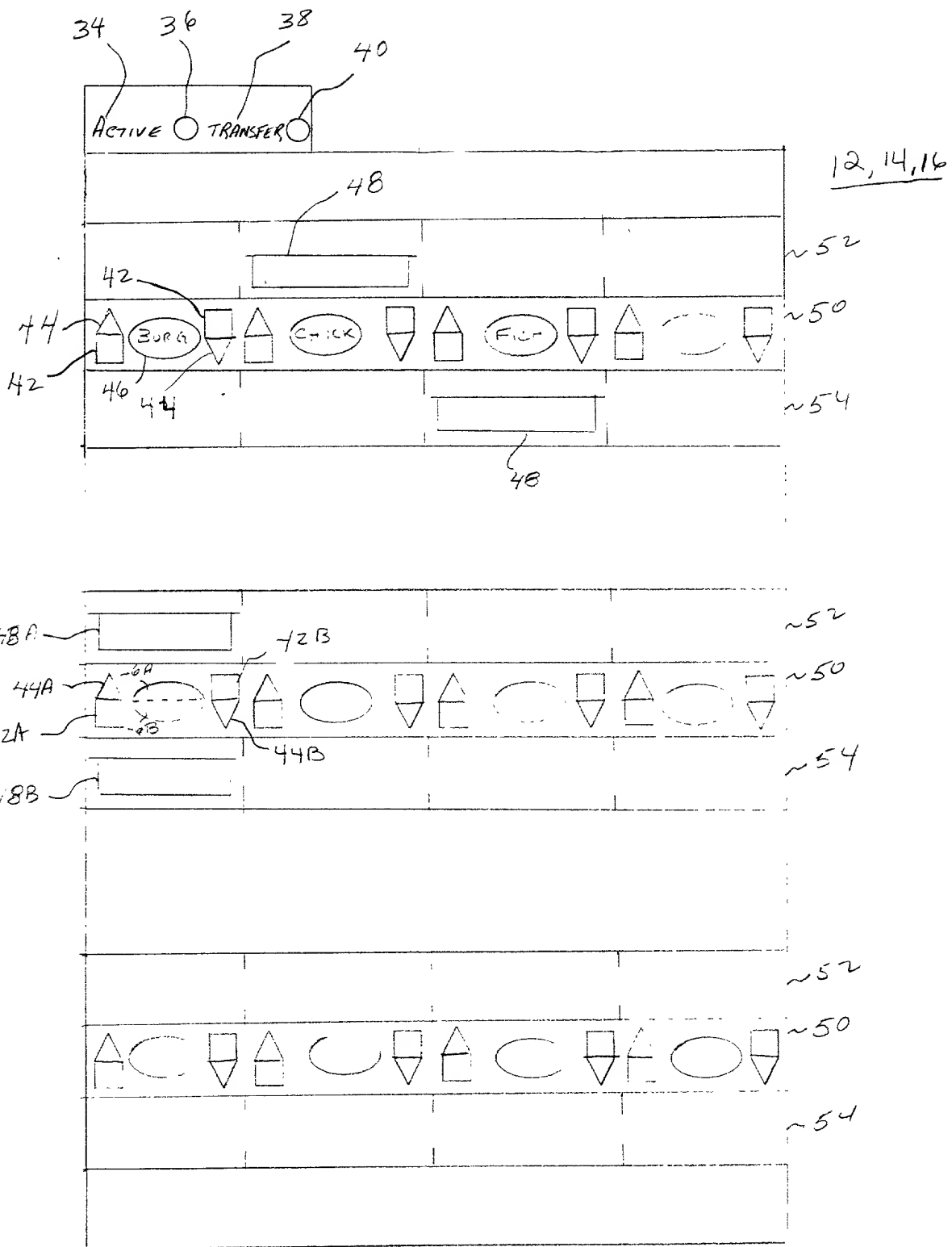


FIGURE 2

006T07 84526960

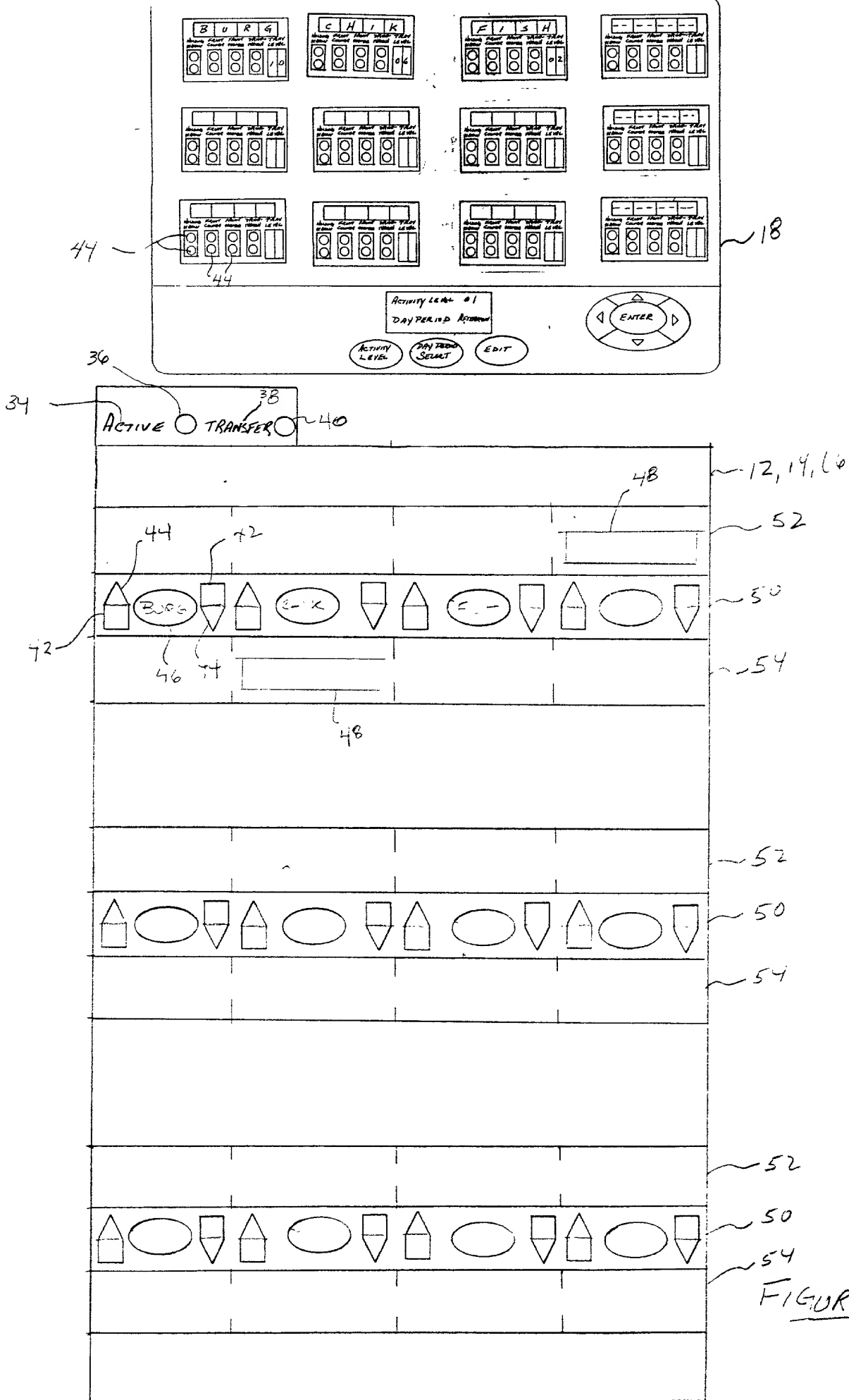


FIGURE 3

132

B	U	R	G
FRONT	FRONT	FRONT	FRONT
COUNTER	COUNTER	COUNTER	COUNTER
THROUGH	THROUGH	THROUGH	THROUGH
LEVEL	LEVEL	LEVEL	LEVEL
10	10	10	10

C	H	I	K
FRONT	FRONT	FRONT	FRONT
COUNTER	COUNTER	COUNTER	COUNTER
THROUGH	THROUGH	THROUGH	THROUGH
LEVEL	LEVEL	LEVEL	LEVEL
06	06	06	06

F	I	S	H
FRONT	FRONT	FRONT	FRONT
COUNTER	COUNTER	COUNTER	COUNTER
THROUGH	THROUGH	THROUGH	THROUGH
LEVEL	LEVEL	LEVEL	LEVEL
02	02	02	02

-	-	-	-
FRONT	FRONT	FRONT	FRONT
COUNTER	COUNTER	COUNTER	COUNTER
THROUGH	THROUGH	THROUGH	THROUGH
LEVEL	LEVEL	LEVEL	LEVEL
-	-	-	-

136

T	A	C	O
FRONT	FRONT	FRONT	FRONT
COUNTER	COUNTER	COUNTER	COUNTER
THROUGH	THROUGH	THROUGH	THROUGH
LEVEL	LEVEL	LEVEL	LEVEL

B	U	R	F
FRONT	FRONT	FRONT	FRONT
COUNTER	COUNTER	COUNTER	COUNTER
THROUGH	THROUGH	THROUGH	THROUGH
LEVEL	LEVEL	LEVEL	LEVEL

134

FRONT	FRONT	FRONT	FRONT
COUNTER	COUNTER	COUNTER	COUNTER
THROUGH	THROUGH	THROUGH	THROUGH
LEVEL	LEVEL	LEVEL	LEVEL

137

-	-	-	-
FRONT	FRONT	FRONT	FRONT
COUNTER	COUNTER	COUNTER	COUNTER
THROUGH	THROUGH	THROUGH	THROUGH
LEVEL	LEVEL	LEVEL	LEVEL
-	-	-	-

136

FRONT	FRONT	FRONT	FRONT
COUNTER	COUNTER	COUNTER	COUNTER
THROUGH	THROUGH	THROUGH	THROUGH
LEVEL	LEVEL	LEVEL	LEVEL

FRONT	FRONT	FRONT	FRONT
COUNTER	COUNTER	COUNTER	COUNTER
THROUGH	THROUGH	THROUGH	THROUGH
LEVEL	LEVEL	LEVEL	LEVEL

FRONT	FRONT	FRONT	FRONT
COUNTER	COUNTER	COUNTER	COUNTER
THROUGH	THROUGH	THROUGH	THROUGH
LEVEL	LEVEL	LEVEL	LEVEL

-	-	-	-
FRONT	FRONT	FRONT	FRONT
COUNTER	COUNTER	COUNTER	COUNTER
THROUGH	THROUGH	THROUGH	THROUGH
LEVEL	LEVEL	LEVEL	LEVEL
-	-	-	-

ACTIVITY LEVEL 01

DAY PERIOD AFTERNOON

MENU

DAY PART SELECT

ACTIVITY LEVEL

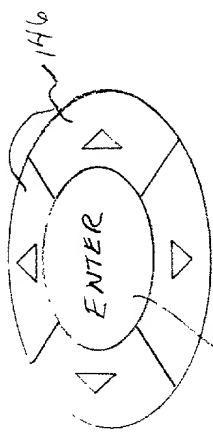


FIGURE 4

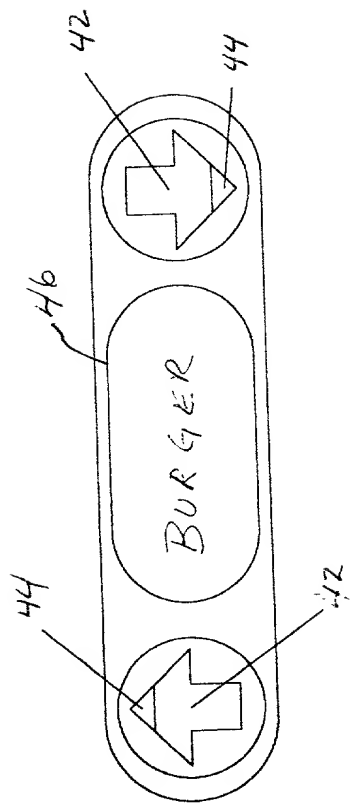


FIGURE 5A

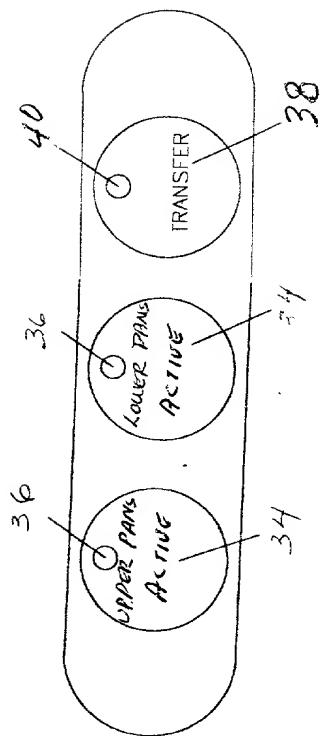


FIGURE 5B

```

graph TD
    Start([ACTIVE/INACTIVE STATION ROUTINE]) --> D1{WAS ACTIVE KEY SELECTED? 56}
    D1 -- N --> D2{IS STATION IN ACTIVE MODE? 58}
    D1 -- Y --> D2
    D2 -- N --> P1[STATION ENTERS ACTIVE MODE WHEREIN  
(1) ACTIVE INDICATORS ILLUMINATED  
(2) PRODUCT STATUS INDICATORS INDICATE STATUS OF CORRESPONDING PRODUCTS 60]
    D2 -- Y --> P2[STATION ENTERS INACTIVE MODE WHEREIN  
(1) ACTIVE INDICATOR IS TURNED OFF  
(2) PRODUCT STATUS INDICATORS ARE TURNED OFF  
(3) IF THE PRODUCT IS BEING TINED OR SAVING TUNING 62]
    P1 --> End([END])
    P2 --> End
  
```

FIGURE 6

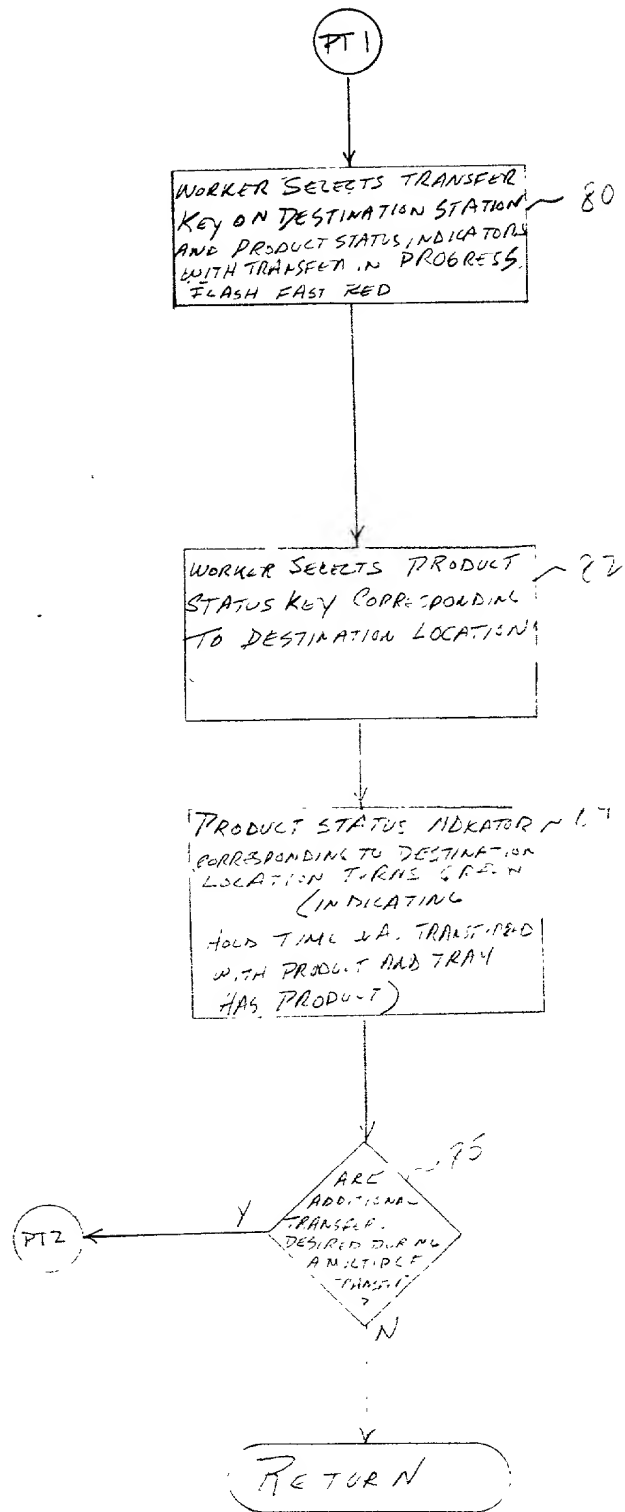
```

graph TD
    Start([PRODUCT TRANSFER ROUTINE]) --> D64{WAS TRANSFER KEY  
SELECTED AT A  
STATION  
(SOURCE  
STATION)}
    D64 -- N --> Start
    D64 -- Y --> P66[TRANSFER INDICATOR  
CORRESPONDING TO SOURCE  
LOCATION IS ILLUMINATED]
    P66 --> P68[SOURCE STATION ENTERS  
TRANSFER MODE]
    P68 --> P72[PRODUCT STATUS INDICATORS  
CORRESPONDING TO PRODUCT  
HAVING THE LONGEST STORAGE TIME  
FLASH FAST GREEN  
(INDICATING HOLD TIME TO TRANSFER OUT)]
    P72 --> P74[PRODUCT STATUS INDICATOR  
CORRESPONDING TO LOCATION  
WITH TRANSFER IN PROGRESS  
FLASH FAST RED  
(INDICATING HOLD TIME TO TRANSFER IN)]
    P74 --> P76[WORKER REMOVES PRODUCT  
TO BE TRANSFERRED FROM  
SOURCE LOCATION AND SELECTS  
CORRESPONDING PRODUCT STATUS  
KEY MAKING HOLD TIME  
AVAILABLE TO BE TRANSFERRED  
OUT]
    P76 --> P78[WORKER PLACES PRODUCT  
BEING TRANSFERRED INTO  
DESTINATION LOCATION IN  
STATION INTO WHICH  
PRODUCT IS TO BE  
TRANSFERRED  
(DESTINATION STATION)]
    P78 --> PT1((PT1))
    PT1 --> PT2((PT2))
    PT2 --> D70{HAS  
TRANSFER  
TIME  
EXPIRED}
    D70 -- N --> D64
    D70 -- Y --> P71[LEAVE TRANSFER  
MODE]
    P71 --> P68
  
```

FIGURE 7A

Figure 1 consists of 12 sub-graphs (a-l) showing the effect of various parameters on the maximum concentration ( $C_{max}$ ) of a drug. The y-axis for all graphs is  $C_{max}$  (mg/L), ranging from 0 to 100. The x-axis for each graph represents a different parameter:

- a) pH:**  $C_{max}$  increases from approximately 20 mg/L at pH 1 to 80 mg/L at pH 7, then decreases to 40 mg/L at pH 8.
- b) Ionic strength:**  $C_{max}$  increases from approximately 20 mg/L at 0.01 M to 80 mg/L at 0.1 M, then decreases to 40 mg/L at 0.5 M.
- c) Temperature:**  $C_{max}$  increases from approximately 20 mg/L at 20°C to 80 mg/L at 40°C, then decreases to 40 mg/L at 60°C.
- d) Stirring speed:**  $C_{max}$  increases from approximately 20 mg/L at 100 rpm to 80 mg/L at 300 rpm, then decreases to 40 mg/L at 500 rpm.
- e) Particle size:**  $C_{max}$  decreases from approximately 80 mg/L at 100  $\mu$ m to 20 mg/L at 10  $\mu$ m.
- f) Particle size distribution:**  $C_{max}$  increases from approximately 20 mg/L at 10  $\mu$ m to 80 mg/L at 100  $\mu$ m, then decreases to 40 mg/L at 500  $\mu$ m.
- g) Particle size distribution (log scale):**  $C_{max}$  increases from approximately 20 mg/L at 10  $\mu$ m to 80 mg/L at 100  $\mu$ m, then decreases to 40 mg/L at 500  $\mu$ m.
- h) Particle size distribution (log scale):**  $C_{max}$  increases from approximately 20 mg/L at 10  $\mu$ m to 80 mg/L at 100  $\mu$ m, then decreases to 40 mg/L at 500  $\mu$ m.
- i) Particle size distribution (log scale):**  $C_{max}$  increases from approximately 20 mg/L at 10  $\mu$ m to 80 mg/L at 100  $\mu$ m, then decreases to 40 mg/L at 500  $\mu$ m.
- j) Particle size distribution (log scale):**  $C_{max}$  increases from approximately 20 mg/L at 10  $\mu$ m to 80 mg/L at 100  $\mu$ m, then decreases to 40 mg/L at 500  $\mu$ m.
- k) Particle size distribution (log scale):**  $C_{max}$  increases from approximately 20 mg/L at 10  $\mu$ m to 80 mg/L at 100  $\mu$ m, then decreases to 40 mg/L at 500  $\mu$ m.
- l) Particle size distribution (log scale):**  $C_{max}$  increases from approximately 20 mg/L at 10  $\mu$ m to 80 mg/L at 100  $\mu$ m, then decreases to 40 mg/L at 500  $\mu$ m.



File 7B

006701 82826360

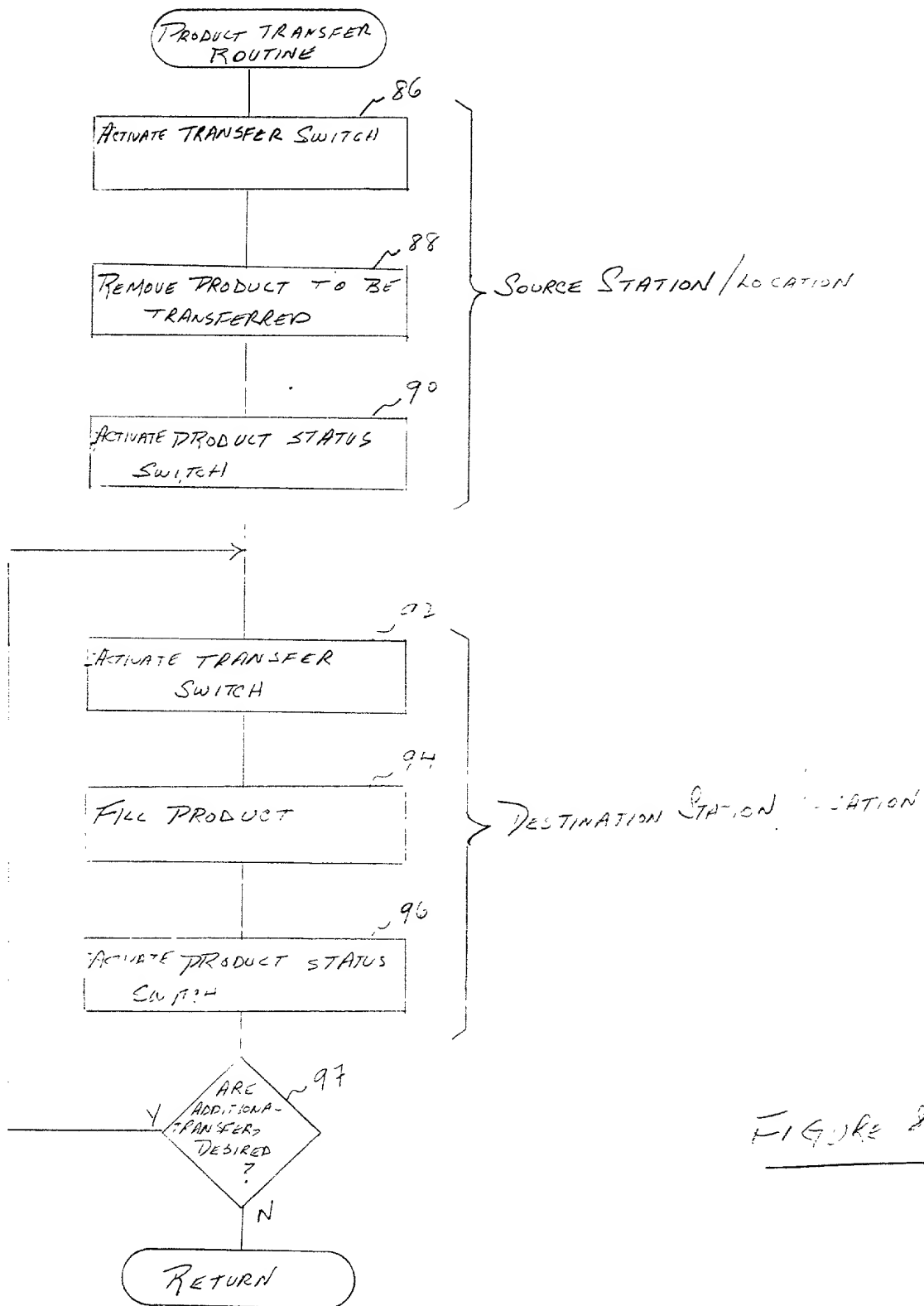


FIGURE 2A



006707 0200000000

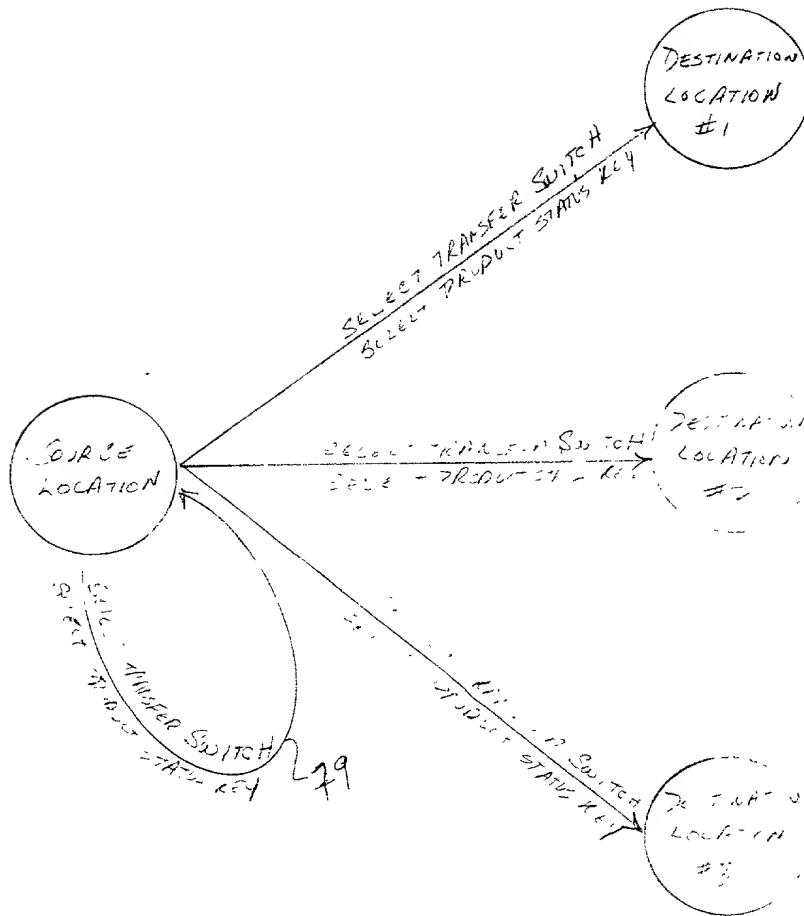


FIGURE 8B

00692578 101900

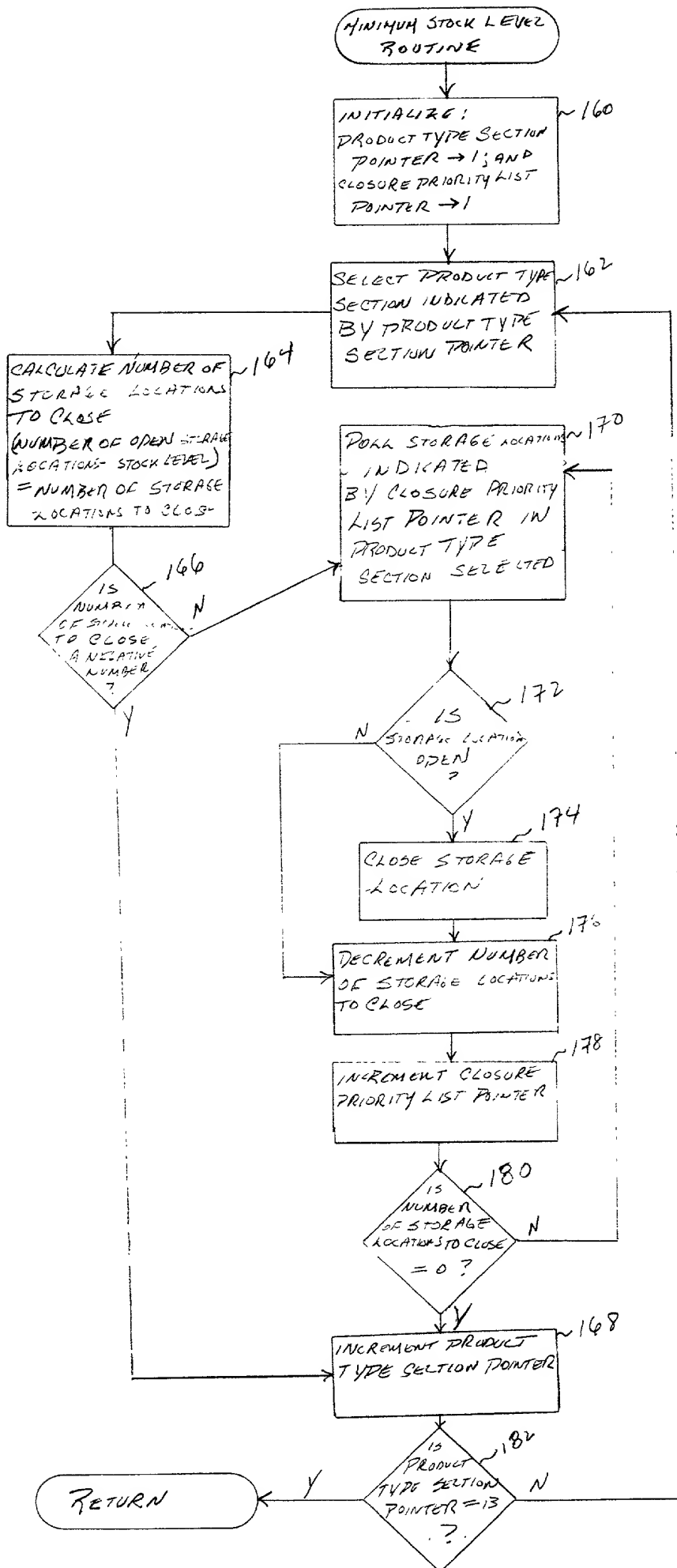


FIGURE 8C

005101" 82526900

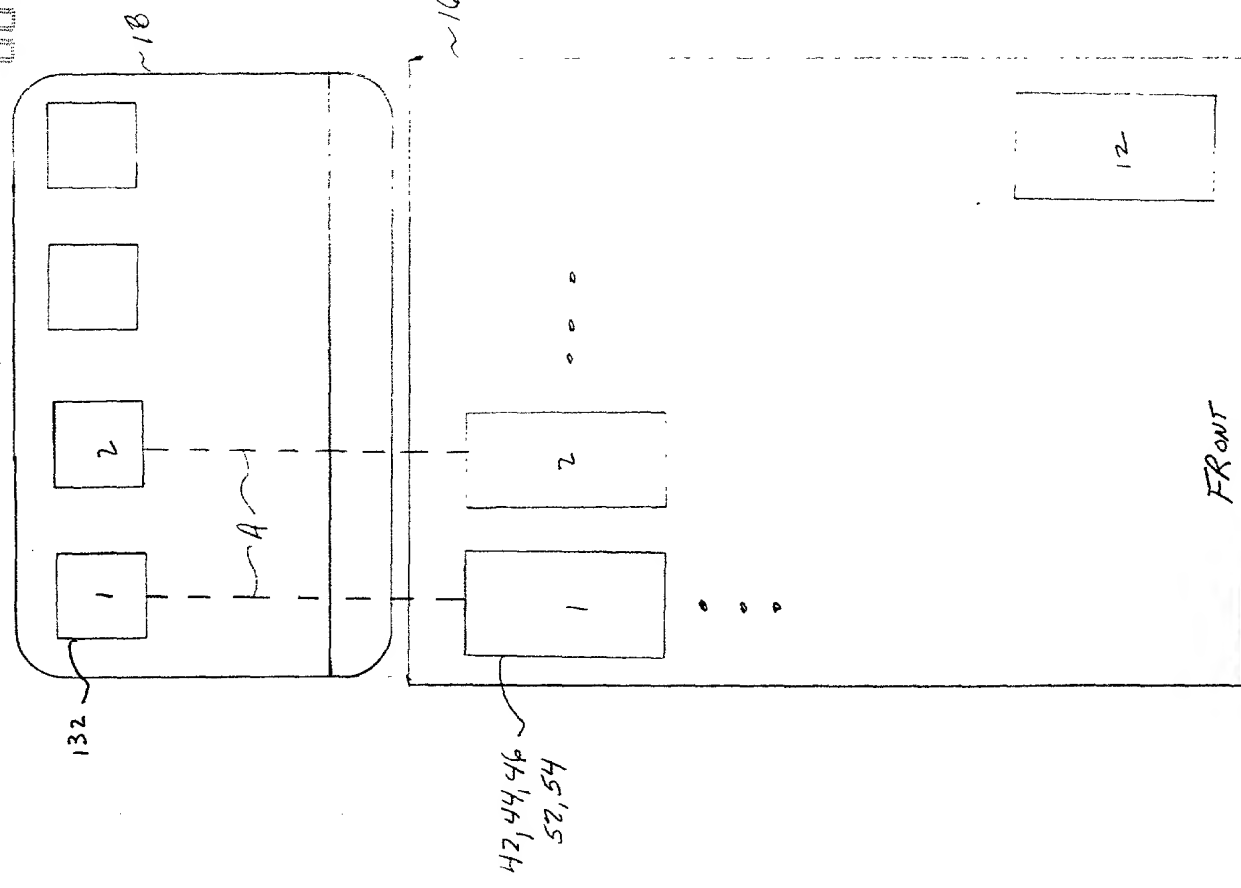


FIGURE 8D

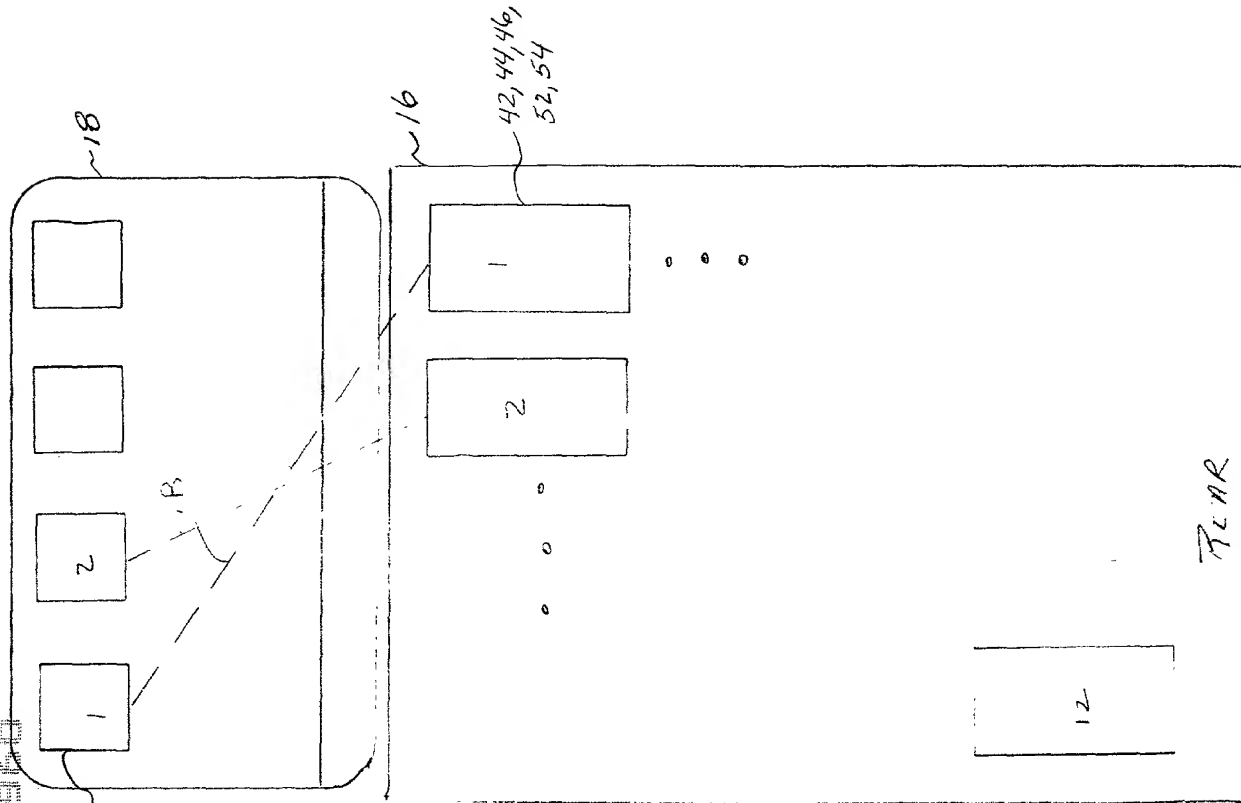


FIGURE 8E

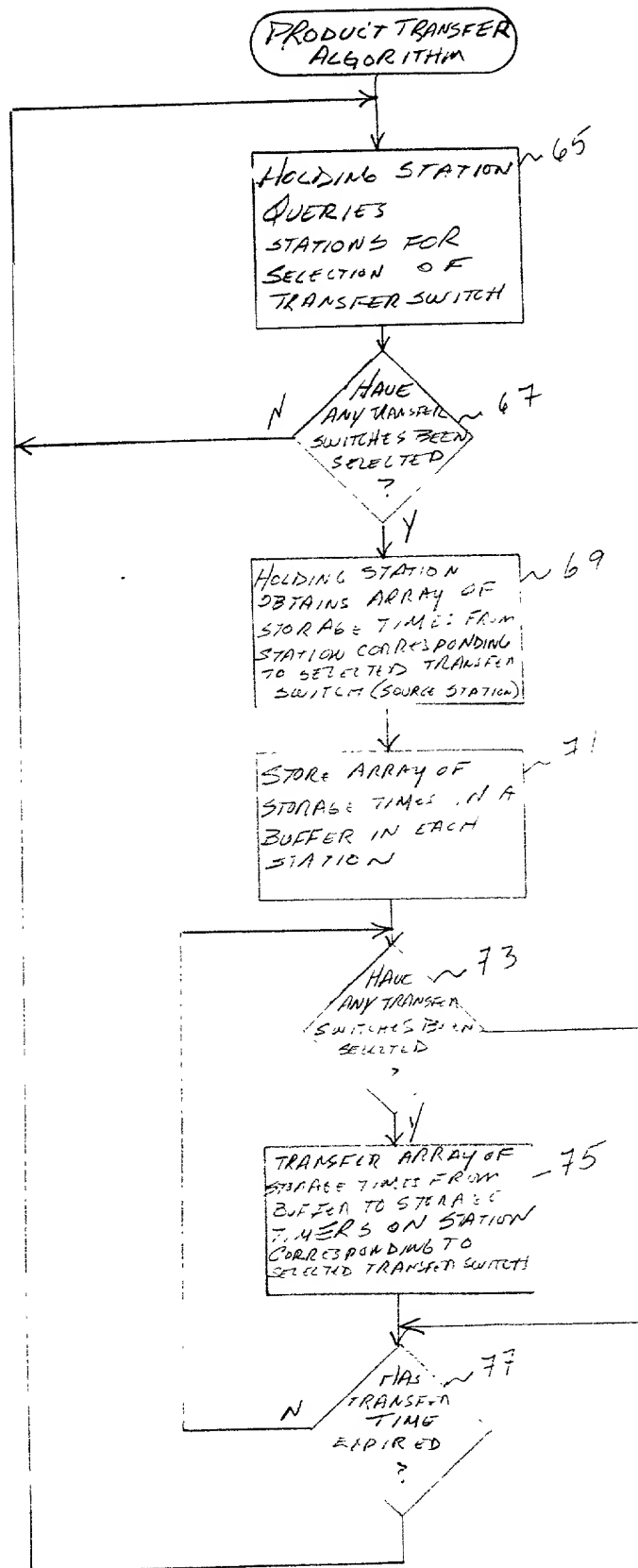
[illegible]

FIGURE 8F

POWER-ON  
(START)

ALL STATIONS ENTER  
ACTIVE MODE WHEREIN:  
(1) ACTIVE INDICATORS ARE ON  
(2) PRODUCT STATUS  
INDICATORS ARE RED  
(INDICATING TRAYS ARE  
EMPTY AND REQUIRE  
PRODUCT)

B

WORKER COOKS PRODUCT  
AND PLACES PRODUCT  
INTO PAN.

WORKER PLACES PAN INTO  
STATION AT LOCATION  
BEARING PRODUCT LABEL  
CORRESPONDING TO  
PRODUCT COOKED

WORKER SELECTS PRODUCT  
STATUS SWITCH CORRESPONDING  
TO LOCATION JUST FILLED  
WITH PAN UNTIL  
CORRESPONDING PRODUCT  
STATUS INDICATORS  
TURN GREEN

TIMER INITIATES  
COUNT OF STORAGE TIME  
IN RESPONSE TO PRODUCT  
STATUS INDICATORS  
TURNING GREEN

A

INITIALLY, FOLLOWING  
POWER-ON, THIS PATH  
WILL PREFERABLY BE  
TAKEN A NUMBER  
OF TIMES TO PROVIDE  
A SUFFICIENT QUANTITY  
OF EACH OF THE  
DIFFERENT PRODUCTS  
OFFERED FOR SALE

FIGURE 9A

00692578 101900

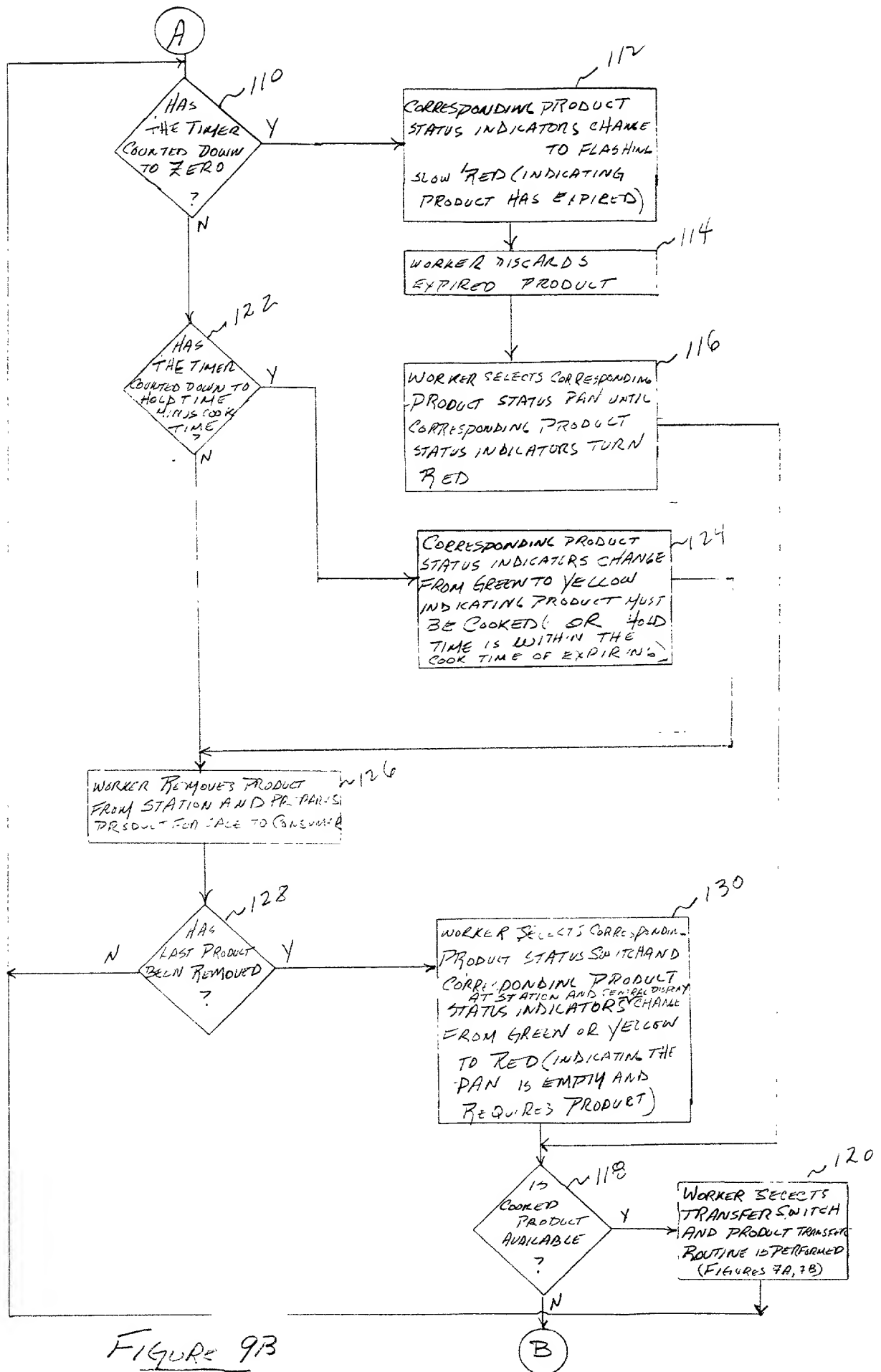
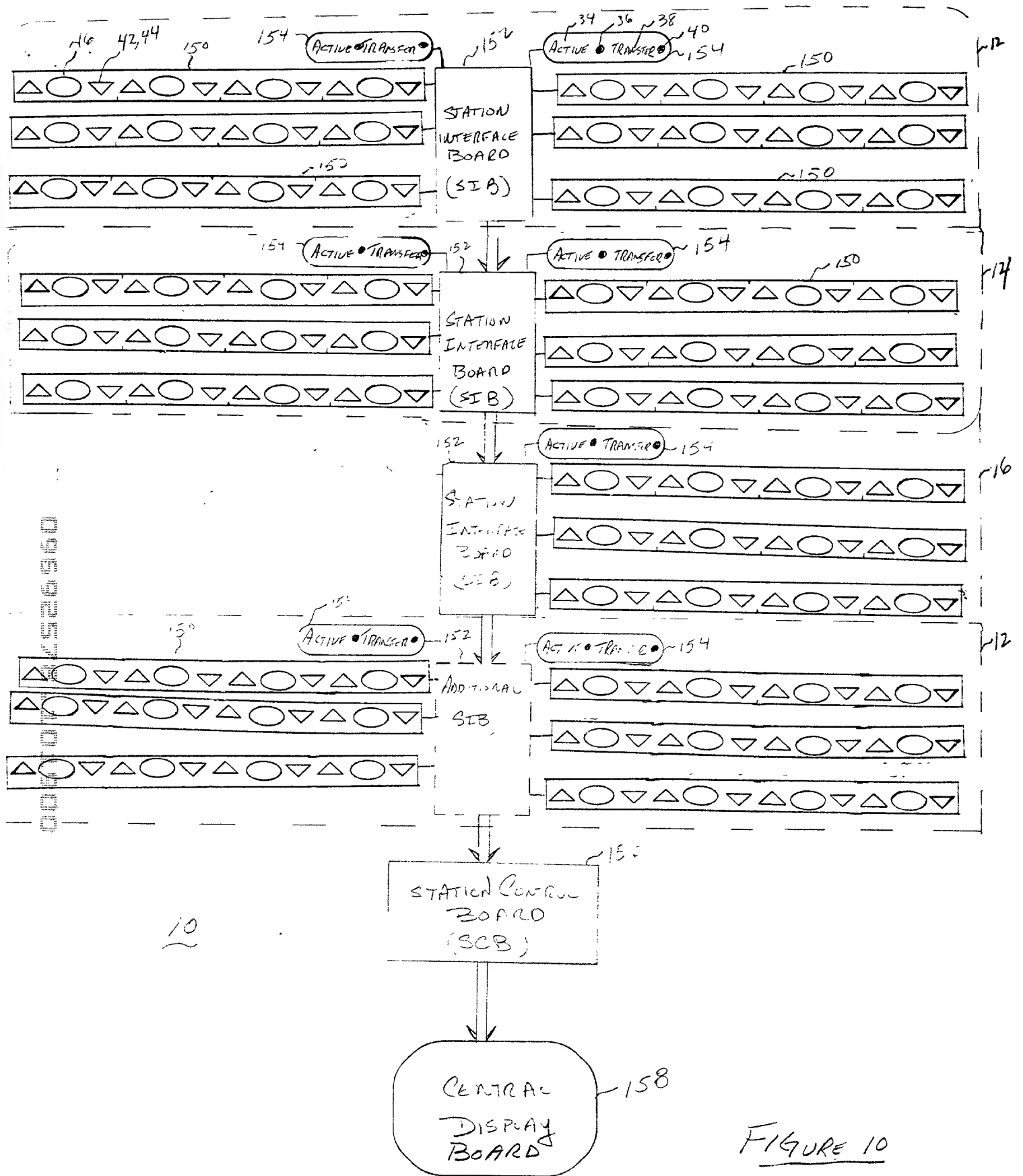
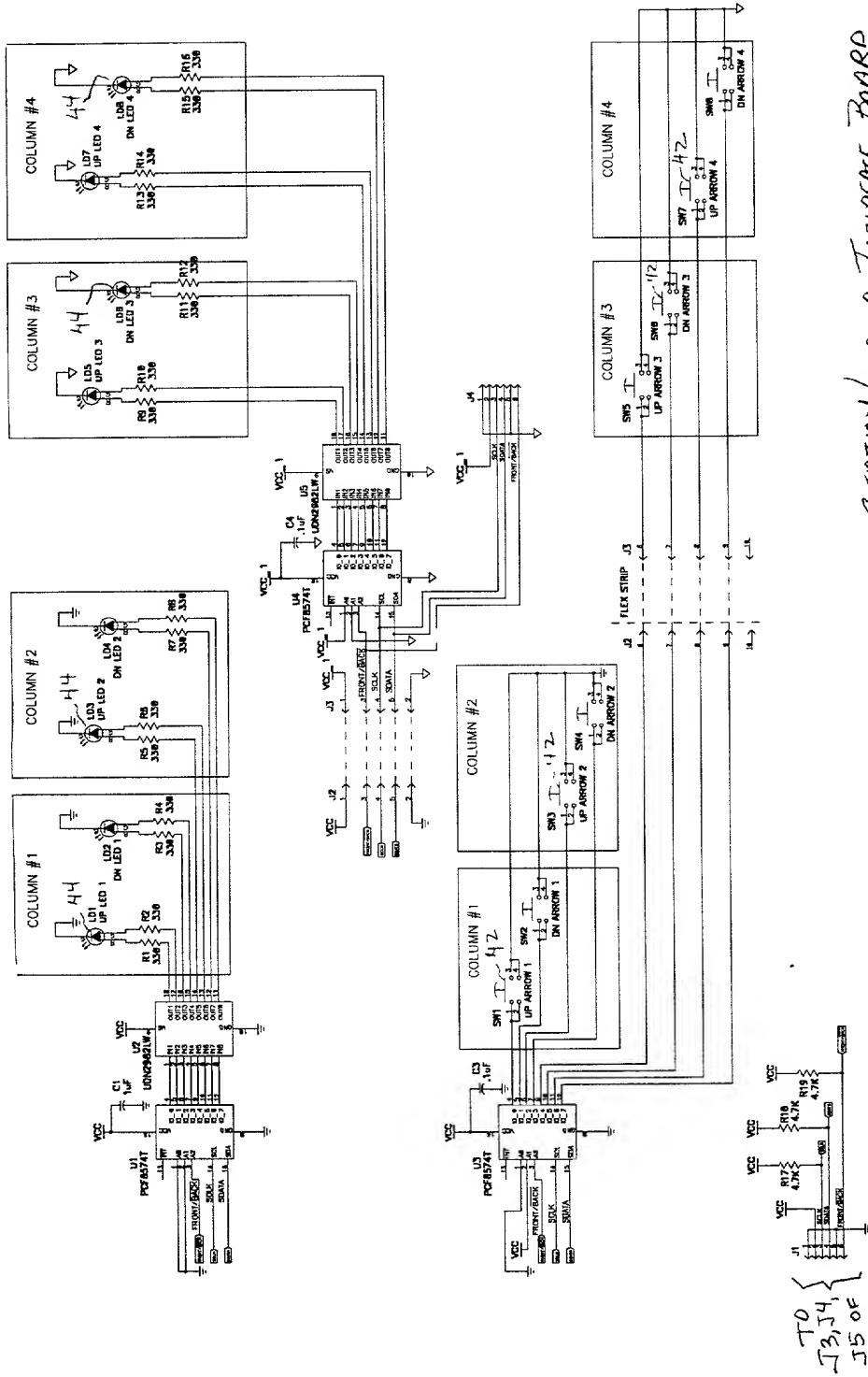


FIGURE 9B







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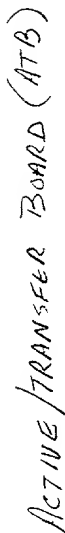
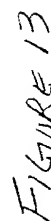


FIGURE 12

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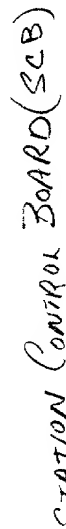
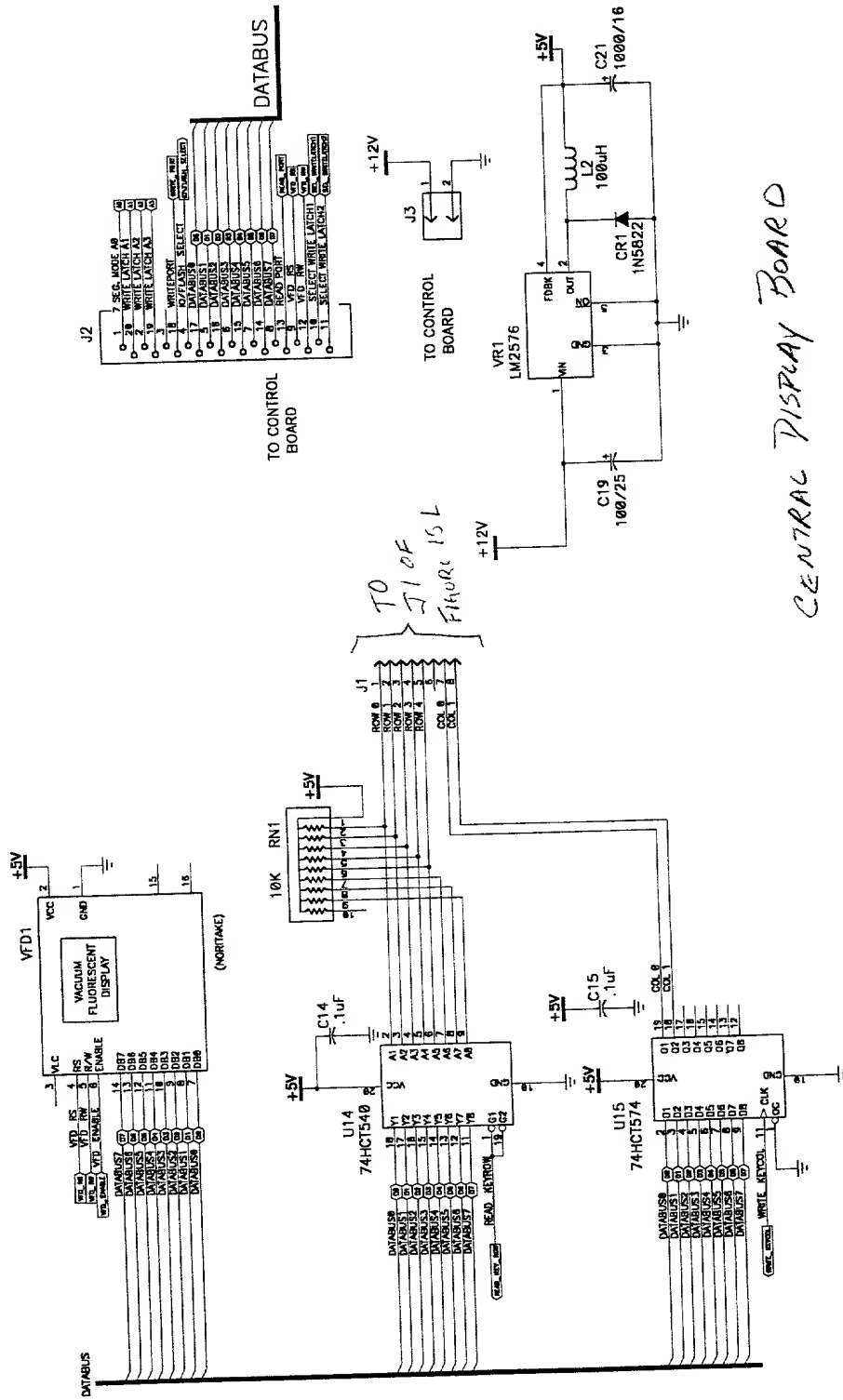


FIGURE 14B



CENTRAL DISPLAY BOARD

Figure 15A

The schematic diagram illustrates the Central Display Board, which consists of three 74LS138 decoders (U16, U17, U18) and a 74HC1574 shift register (U13). The board is powered by +5V supply rails, with decoupling capacitors C13, C16, C17, and C18. The 74LS138 decoders are configured to generate control signals for the shift register and other components. The 74HC1574 shift register is used to store and shift data. A transistor Q1 (2N7000) is used to drive the VFD enable line. The board is labeled 'CENTRAL DISPLAY BOARD'.

# CENTRAL DISPLAY BOARD

FIGURE 15B



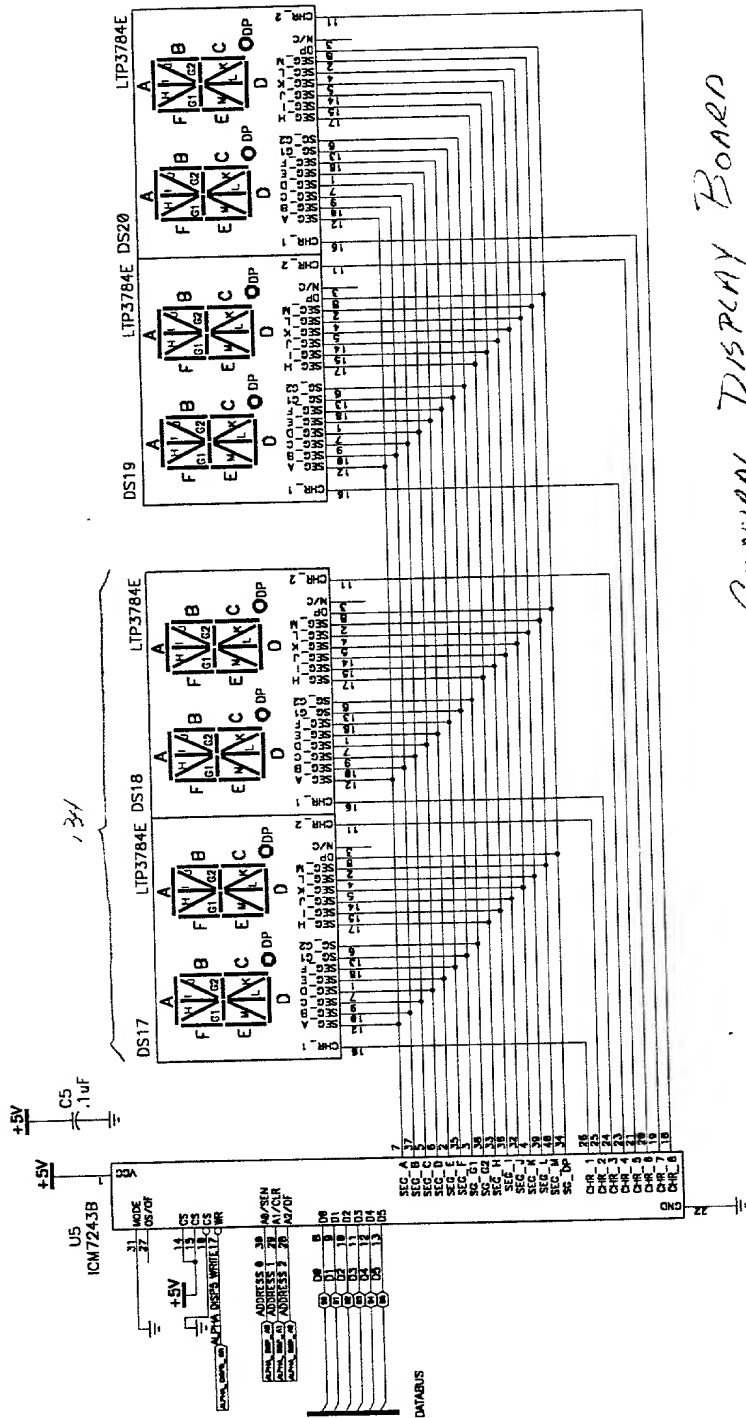








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CENTRAL DISPLAY BOARD

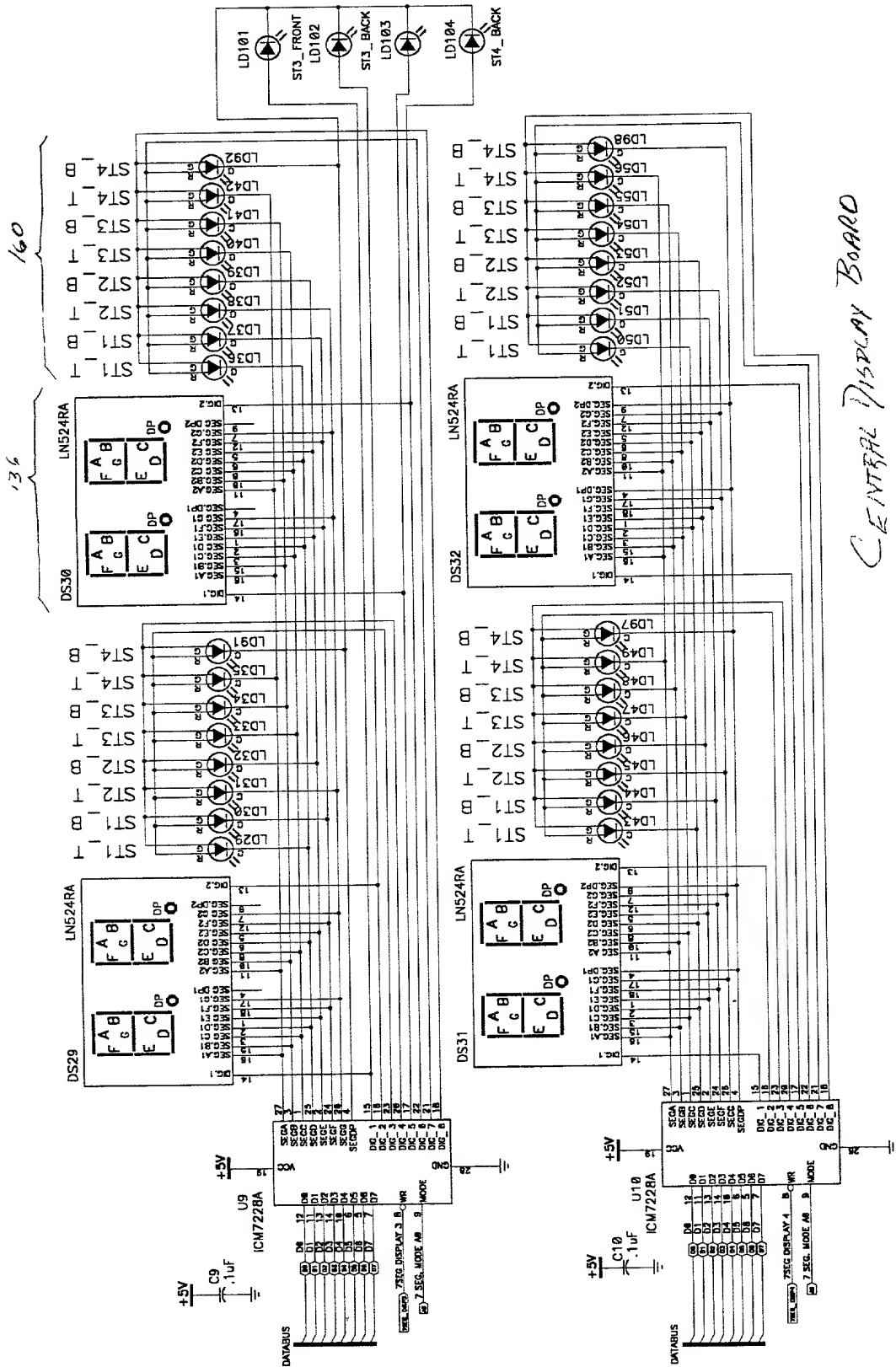
FIGURE 159



[illegible]

CENTRAL DISPLAY BOARD

FIGURE 15I



CENTRAL DISPLAY BOARD

FIGURE 15J

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FIGURE 15K





**COMBINED DECLARATION AND POWER OF ATTORNEY**

(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL,  
DIVISIONAL, CONTINUATION OR CIP)

As a below named inventor, I hereby declare that:

**TYPE OF DECLARATION**

This declaration is of the following type: *(check one)*

- |  |   |
|--|---|
| <input checked="" type="checkbox"/> Original | <input type="checkbox"/> National Stage PCT         |
| <input type="checkbox"/> Supplemental        | <input type="checkbox"/> Divisional                 |
| <input type="checkbox"/> Design              | <input type="checkbox"/> Continuation               |
|  | <input type="checkbox"/> Continuation-in-Part (CIP) |

**INVENTORSHIP IDENTIFICATION**

**NOTE:** *If the inventors are each not the inventors of all the claims an explanation of the facts, including the ownership of all the claims at the time the last claimed invention was made, should be submitted.*

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**METHOD AND APPARATUS FOR MONITORING THE STATUS AND TRANSFER OF FOOD PRODUCTS**

the specification of which: *(complete (a), (b) or (c))*

- (a) ☒ is attached hereto.
- (b) ☐ was filed on \_\_\_\_\_ as  
☐ Serial No. **08/**\_\_\_\_\_ or  
☐ Express Mail No. \_\_\_\_\_, as Serial No. not yet known  
and was amended on \_\_\_\_\_. *(If applicable)*
- (c) ☐ was described and claimed in PCT International Application No. PCT/  
filed on \_\_\_\_\_ and as amended under PCT Article 19 on \_\_\_\_\_. *(If any)*

**ACKNOWLEDGMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR**

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above, and that the filing of said specification, if heretofore filed, was authorized by me.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

**CLAIM OF PRIORITY OF EARLIER FOREIGN APPLICATION(S) UNDER 35 U.S.C. §119(a)-(d)**

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

*(List prior foreign/PCT application(s) filed within 12 months (6 months for design) prior to this U.S. application.)*

NOTE: Where item (c) is entered above and the International Application which designated the U.S. claimed priority check item (e), enter the details below and make the priority claim.

COUNTRY (orPCT)	APPLICATION NO.	DATE OF FILING (Day/Month/Year)	PRIORITY CLAIMED UNDER 35 USC §119
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO

**CLAIM FOR BENEFIT OF PRIOR U.S. PROVISIONAL APPLICATION(S) UNDER 35 U.S.C. §119(e)**

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below:

*(List prior U.S. provisional applications.)*

PROVISIONAL APPLICATION NO.	FILING DATE (Day/Month/Year)
60/160,878	22/10/99

**CLAIM FOR BENEFIT OF EARLIER U.S./PCT APPLICATION(S) UNDER 35 U.S.C. 120**

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in such prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

(List prior U.S. applications or PCT international applications designating the U.S. for benefit under 35 U.S.C. §120.)

#### U.S. APPLICATIONS

STATUS (Check One)

U.S. SERIAL NO.	U.S. FILING DATE (Day/Month/Year)	Patented	Pending	Abandoned
0 /		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0 /		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### PCT APPLICATIONS DESIGNATING THE U.S.

STATUS (Check One)

PCT APPLN. NO.	PCT FILING DATE (Day/Month/Year)	U.S. SERIAL NOS ASSIGNED (If any)	Patented	Pending	Abandoned
PCT/			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PCT/			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### 35 USC 119 PRIORITY CLAIM, IF ANY, FOR ABOVE LISTED U.S./PCT APPLICATIONS

PRIORITY APPLICATION NO.	PRIORITY COUNTRY	FILING DATE (Day/Month/Year)	ISSUE DATE (Day/Month/Year)

#### POWER OF ATTORNEY

As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office in connection therewith:

Charles R. Hoffmann, Reg. No. 24,102; Ronald J. Baron, Reg. No. 29,281; Gerald T. Bodner, Reg. No. 30,449; Alan M. Sack, Reg. No. 31,874; A. Thomas Kammer, Reg. No. 28,226; R. Glenn Schroeder, Reg. No. 34,720; Glenn T. Henneberger, Reg. No. 36,074; Irving N. Feit, Reg. No. 28,601; Anthony E. Bennett, Reg. No. 40,910; Gregory W. Bachmann, Reg. No. 41,593; Steven T. Zuschlag, Reg. No. 43,309; Susan A. Sipos, Reg. No. 43,128, Kevin E. McDermott, Reg. No. 35,946; Robert C. Morriss, Reg. No. 42,910; Rod S. Turner, Reg. No. 38,639; James F. Harrington, Reg. No. 44,741; Algis Anilionis, Reg. No. 36,995; Justin K. Holmes, Reg. No. 42,666; and Joseph J. Catanzaro, Reg. No. 25,837, each of them of HOFFMANN & BARON, LLP, 6900 Jericho Turnpike, Syosset, New York 11791; and Daniel A. Scola, Jr., Reg. No. 29,855; Salvatore J. Abbruzzese, Reg. No. 30,152; Kellyanne Merkel, Reg. No. 43,800; Keith R. Lange, Reg. No. 44,201; John Sopko, Reg. No. 41,321; Barry Jacobsen, Reg. No. 43,689; Gloria K. Szakiel, Reg. No. 45,149; and Mark E. Baron, Reg. No. 46,150, each of them of HOFFMANN & BARON, LLP, 1055 Parsippany Boulevard, Parsippany, New Jersey 07054.

PLEASE SEND CORRESPONDENCE TO:

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PLEASE DIRECT TELEPHONE CALLS TO:

Gerald T. Bodner, Esq.  
(516) 822-3550

**DECLARATION**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**SIGNATURE(S)**

Full Name of Sole or First Inventor: Mark Salerno

Country of Citizenship: USA

Residence Address: 13 Harmony Road, Huntington, New York 11743

Post Office Address: Same

Date: 10/13/2000 Inventor's signature

*Mark Salerno*

NOTE: All above spaces identifying inventors must be completed or deleted before any inventor executes this application